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Phase 1 Muddy River Flood Control, Water Quality and Habitat Enhancement, and Historic Preservation Project

Volume 6
Appendix H Structural Evaluations and Inventory, Muddy River Bridges
Appendix I Preliminary Design Report

December 2001

Prepared By: **CDM**

In Association with:

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Pressley Associates, Inc.
Vanasse Hangen Brustlin, Inc.

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APPENDIX H

STRUCTURAL EVALUATION AND INVENTORY MUDDY RIVER BRIDGES

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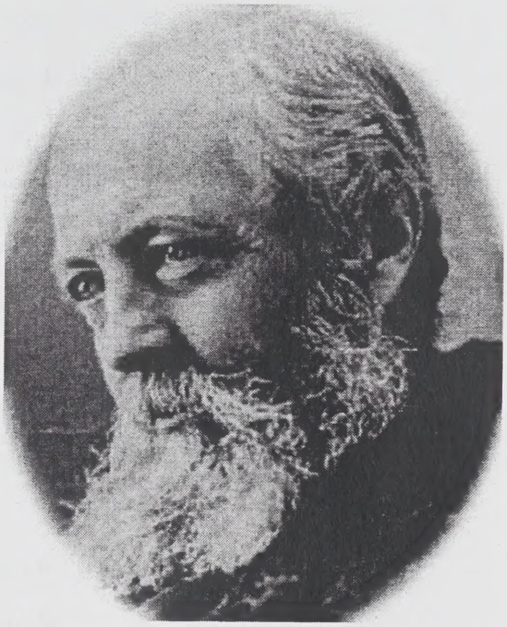
STRUCTURAL EVALUATION & INVENTORY

Muddy River Bridges



FREDERICK LAW OLMSTED
(1822-1903)

Boston/Brookline
Massachusetts

Prepared for **Boston Parks and Recreation Department**
Prepared by ***VHB*/Vanasse Hangen Brustlin, Inc.**
Boston, Massachusetts
Submitted **August 2000**
Revised **March 2001**

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I. EXECUTIVE SUMMARY

Vanasse Hangen Brustlin, Inc. (VHB) has been hired as a subconsultant of Camp Dresser & McKee, Inc. (CDM) to take part in a project by the Boston Parks and Recreation Department who propose several improvements to the Muddy River between Jamaica Pond and the Charles River. The goal of the project is to provide flood control, improve water quality, restore historic resources, enhance aquatic and riparian habitat and institute Best Management Practices (BMPs). Dredging is the preferred alternative to provide flood control, water quality improvements, and habitat enhancement in the open channel sections of the river. Part of VHB's role in the project is to compile an Inventory of the existing bridges that span the river and investigate the impact of the dredging process on these structures. Five of the bridges are along proposed haul routes. These bridges were classified as "Critical" and load rated to determine if they could accommodate project vehicles.

The majority of the bridges date back to an earlier project to improve the Muddy River that occurred in the late 1800's. The original "Muddy River Improvement" project was undertaken by the famous landscape architect Frederick Law Olmsted as part of his Emerald Necklace park project. Olmsted designed most of these bridges as brick arches of variable span length with stone façades.

The Inventory process included gathering information such as bridge type, owner, dates of construction/rehabilitation, and basic bridge geometry for each of the bridges. During site visits, each of the major bridge components was rated on a scale from 0 to 9. The individual ratings were used to assess the overall condition of the bridge and assign an overall rating. There are also accompanying photographs of each of the bridges. A complete Inventory of all the bridges is located in Appendix A of this report.

Research at various city, state and national agencies has resulted in the location of many existing plans and reports pertaining to the bridges. The drawings show that many of the bridges are founded on timber mats supported by timber piles. Several of these mats are continuous from abutment to abutment. Great care must be taken to ensure that these mats are not damaged during the dredging process. From these plans, VHB has been able to determine the original existing riverbed grade for many of the bridges and develop criteria to estimate riverbed grades for bridges where no existing information is available. This information has been compiled into typical cross sections showing a "limit of dredging" for each of the bridges. Typical cross sections are located in Appendix B of this report.

Project vehicles must use five of the bridges (Boylston Street, Agassiz Bridge, Netherlands Road, Jamaicaway Exit, and Ward's Pond) to gain access to certain areas of the site in order to bring equipment in and waste material out. Each of these "Critical" bridges was rated for a maximum 50-ton vehicle representative of a fully loaded trailer dump truck. Calculations indicate that the bridges have sufficient strength to accommodate these vehicles. As an extra measure of safety, a 10 m.p.h. speed limit will be imposed on all vehicles as they go over the bridges. Also, minimum wheel edge distances must be followed to insure proper load distribution. Preliminary calculations indicate there will be about 10 additional trucks on each bridge per day. This is an increase of approximately 10% for Boylston Street and Agassiz Bridge and about 35% for Netherlands Road. Trucks are prohibited from the Jamaicaway and permission from the state will be required to use this road to haul materials. Ward's Pond is a pedestrian bridge, although it has sufficient structural capacity to handle trucks, special permission may be required here as well. Wheel edge distances are noted in Section IV and th bridge ratings can be found in Appendix C of this report.

All of the bridges, except for the Ipswich Street Bridge, are in good condition. Many the bridges need minor repairs including repointing masonry, washing stones, replacin missing stones, upgrading railing, removing vegetation, repairing walk surfaces an repairing bridge joints. Table 2 "Suggested Rehabilitation–Muddy River Bridges" show the suggested repairs for each bridge and is located in Section VI, Proje Recommendations.

II. PROJECT BACKGROUND

Location

The project area is the section of the Muddy River between Jamaica Pond and the Charles River in Brookline and Boston, Massachusetts. This area is part of a large park system collectively known as the Emerald Necklace. The specific areas of investigation are the twenty-four bridges that span the Muddy River along its course. See figure 1 for locations of the bridges and figure 2 for the limits of the project.

Existing documents from the following agencies have been obtained for the Structural Evaluation and Inventory:

- Boston Department of Public Works
- Boston Parks and Recreation Department
- Frederick Law Olmsted National Historic Site
- Massachusetts Highway Department
- Massachusetts Turnpike Authority
- Metropolitan District Commission

A complete list of all drawings and plans used to compile this report can be found in Appendix D of this report.

Purpose

The Boston Parks and Recreation Department has contracted with Camp Dresser & McKee Inc. (CDM) of Cambridge, Massachusetts to enhance the Muddy River in the above project area. The proposed enhancements are intended to provide flood control, improve water quality, restore historic resources, enhance aquatic and riparian habitat and institute Best Management Practices (BMPs). Dredging of river sediments is the preferred alternative to provide flood control, water quality improvements, and habitat enhancement in open channel sections of the river. The scope of the project includes evaluating all the bridges in the project area. VHB has been chosen to perform this portion of the project. The scope of VHB's work include:

- Conducting site visit to visually assess each bridge.
- Determining, through research of existing documents, original foundation geometry and elevations.
- Creating an Inventory of all the bridges along the route.
- Evaluating the foundations, where existing information is available, to determine any adverse affects due to the proposed dredging procedure.
- Setting limits of dredging in the bridge areas.
- Load rating of the "Critical" bridges along the haul routes that will be used by CDM to carry dredging equipment to, and dredged materials away from, the site.

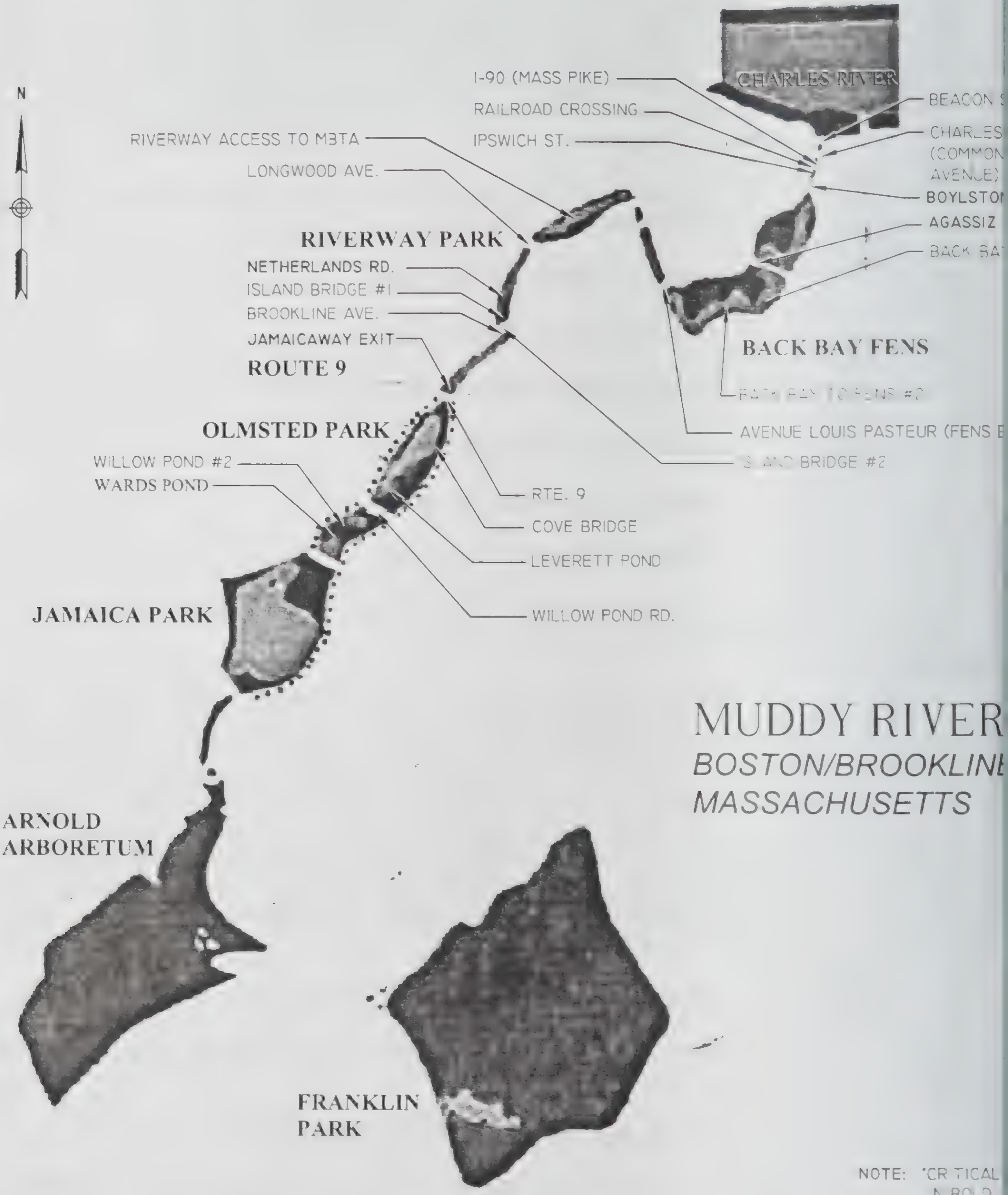
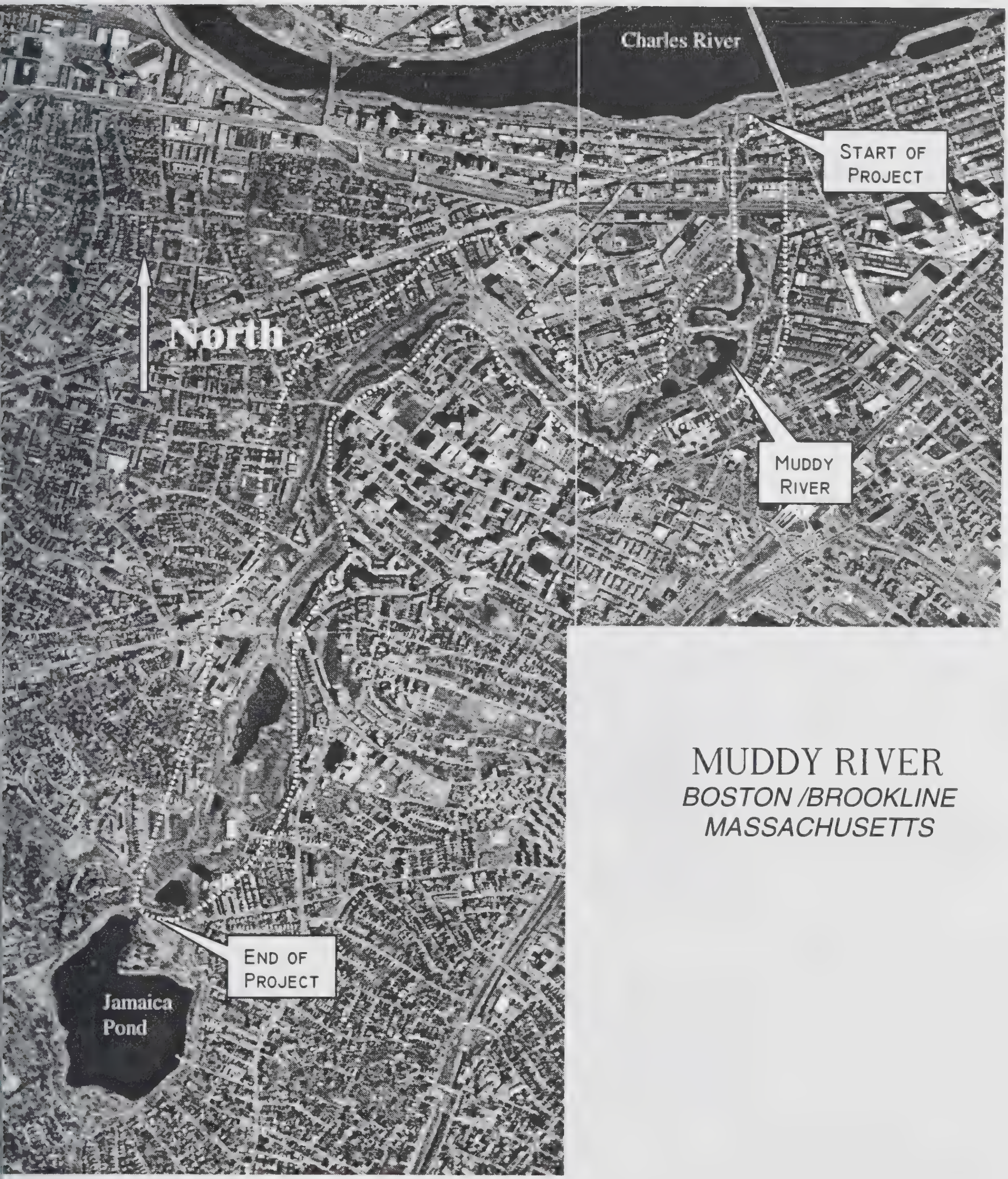


Figure 1

KEY PLAN

NTS



MUDDY RIVER
BOSTON /BROOKLINE
MASSACHUSETTS

gure 2

AERIAL PHOTOGRAPH

III. EXISTING STRUCTURES

General

The original Muddy River Improvement was enacted as one of the final pieces o the "Emerald Necklace" project, devised by Frederick Law Olmsted at the end o the nineteenth century. Olmsted, known as the father of Landscape Architecture designed the park and oversaw its construction between 1878-1896. The majorit of the bridges along the river date back to this time period. Olmsted referred t the bridges and other structures as "furniture" for the park and designed many o them himself. Local architects such as H. H. Richardson; Shepley, Rutan, an Coolidge as well as City Architects, Arthur H. Vinal and E. M. Wheelwrigh designed other bridges[1]. There are twenty-four bridges located in the project area Fourteen of the bridges carry vehicle traffic, nine of the bridges are fo pedestrians and one is a railroad bridge.

Vehicle Bridges

The Beacon Street and Charlesgate (Commonwealth Avenue) bridg superstructures are steel girders with concrete decks. A concrete façade on eac of these bridges gives them the appearance of an arch bridge. The Massachusett Turnpike and Ipswich Street bridges are also steel girders with concrete decks These two bridges do not have arch façades. The Agassiz Bridge is a five spa brick arch structure with stone a façade. Brookline Avenue is a single span bric arch with a stone façade. Route 9 is a cast-in-place concrete arch with stone façade. All seven of these bridges were built on pile supported timber mats tha are continuous along their entire length. The Boylston Street bridge is a singl span brick arch with a stone façade. This bridge was built on a timber mat that i under the abutments only. Longwood Avenue is a two span brick arch structur with stone a façade. Plans for this bridge indicate that it was not founded o piles. The Jamaicaway Exit Ramp bridge is a cast-in-place concrete arch with stone façade. This bridge is founded on a continuous concrete mat. The Avenu Louis Pastuer (Fens Bridge) and Netherlands Road bridges are single span bric arches with stone façades.

Railroad Bridge

The railroad bridge is a steel girder bridge with timber ties. This bridge shares th same substructure as the Ipswich Street Bridge.

Pedestrian Bridges

The Back Bay Fens #1 and #2 bridges are single span cast-in-place concret arches with stone façades. The abutments for these two bridges are supported o a concrete pile cap. The remainder of the pedestrian bridges are single span bric or stone arches with stone façades. According to the plans these foundations ar bearing directly on the soil.

Areas of Investigation

The inspection incorporated reviewing all aspects of the bridge includin evaluation of superstructure, wingwalls, railings etc. that are visible to inspector without disturbing the existing ground or entering the river.

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[1] Zaitzevsky, Cynthia. "*Frederick Law Olmsted and the Boston Park System*" Harvard University Press, pp. 162.

Methods/Limitations

Each of the bridges was researched prior to the field investigation. The inspection was limited to the visual evaluation of the bridges from the banks of the Muddy River and from the bridges themselves. Due to the unsanitary conditions of the river, no inspectors entered the river to inspect any portion of the bridge.

In the event that information could not be obtained from the visual inspection, the investigators relied on existing rating reports, inspection reports and divers activity reports prepared by the Massachusetts Highway Department to determine existing conditions. Each component of the bridge was evaluated on a scale of 0 to 9, with the following designations for each score:

9-Excellent
8-Very Good
7-Good
6-Satisfactory
5-Fair
4-Poor
3-Serious
2-Critical
1-Imminent Failure
0-Failure

After each individual component was rated, the bridge was given an overall rating based on the individual ratings. In addition to the structural condition of each bridge, general information such as bridge owner, date of construction and basic bridge geometry was gathered. Finally, any information relating to the condition of the bridge that the inspector felt was important was noted.

Material testing of samples from existing structures was not part of the scope of the project. Material properties used in calculations were determined from existing data based on the bridges age and composition.

IV. EXISTING FIELD CONDITIONS

Bridge Inventory

All but one of the bridges rated between “Satisfactory” and “Very Go condition with most receiving a “Good” rating. The one exception to this was Ipswich Road Bridge that received a rating of “Serious” based on a recent M rating report. This is due to the poor condition of the bridge superstructure. T bridge has been posted as having a 6-ton weight restriction. The most comm problems found on other bridges were a loss of mortar at the water level a vegetation growing out of the façades of some of the bridges. The Jamaicaw Exit Ramp has some deterioration of the cast-in-place barrel at the façade and Ward’s Pond Bridge is missing a brick from its barrel.

Foundation Considerations

Several of the bridges over the Muddy River were built on timber mats support by timber piles. For all but one of these bridges the mat was made to continuous across its entire length. This was probably intended to give strength the bridge creating, in essence, a tied arch. These mats are generally only a fe feet (less than five) below the lowest grade of the river. The majority of t vehicle bridge foundation types are granite blocks set on the timber. The majori of the foundation types of the pedestrian bridges are granite block found directly on the soil.

Dredging Limitations

Existing plans of the bridges show waterline elevations and approximate riverb elevations. None of the plans show what datum was used to set these elevation In the event that existing drawings are found showing original riverb elevations, the limit of dredging will be set to those elevations shown on t plans. These elevations should be converted to the NGVD datum. In the eve that no existing plans are found, the limit of excavation will be set based on t bottom of river determined through borings taken by CDM. The bottom of t riverbed will be graded back the intersection of the mean average water level a the abutment, at a grade no greater than 2 to 1. In the event that the mean avera water level does not intersect the bridge abutment, the riverbed may be grade back at a rate no greater than 1½ to 1 to the intersection of the mean avera water level and existing ground. See attached sketches in Appendix B for dred limits for each bridge.

Load Rating of Critical Bridges

All of the Critical Bridges were rated for a 50-ton vehicle; representing a full loaded trailer dump truck. Four of the bridges currently carry vehicles with n load restriction. The fifth bridge is a pedestrian bridge. All of the bridges wer found to be within allowable stress limits for the 50-ton vehicle. The only limit that will be placed on the bridges will be a 10 m.p.h. speed limit for all vehicle passing over the bridge and whatever limitations there are as a result of th bridge geometry. The pedestrian bridge will be limited by its width. Under n circumstances shall a wheel load come within 2’-0” of the fascia of this or any o the other bridges. If there is a sidewalk on the bridge the wheel load shall n come within 1’-0” of the edge of sidewalk.

V. CONCLUSIONS

The Inventory of the Muddy River Bridges shows that many of the structures stand much as they did over a hundred years ago and have required little or no rehabilitation work. Four of the bridges have had some minor upgrading in the last five years including pointing of their masonry. There is no evidence of any of the bridges being in distress other than the superstructure of the Ipswich Street bridge that is currently posted for a 15-ton vehicle. Table 1 "Inventory–Muddy River Bridges" shows the results of the Structural Evaluation & Inventory for each bridge.

Through research of existing drawings the approximate existing riverbeds at each of the bridge locations has been determined. In areas where no original information was available, interpolation and comparison with other similar structures has been used to set the approximate riverbed elevations. Based on these criteria, a typical cross section of the riverbed has been developed for each of the bridges.

There is no visual indication that any of the foundations have shifted since their original construction. Many of the foundations sit on timber mats only a few feet below the original riverbed. Also, according to existing plans there are stone mats on the riverbed under several of the bridges. In order to protect these mats and ensure the stability of the abutments and piers the dredging procedure must be capable of accurately excavating to the limits shown on the typical sections without going beyond these limits. If during the dredging process it is determined that the stone mats have been disturbed they should be reconstructed as shown on the original plans.

The compressive strength of the bricks used in the brick arch bridges was assumed to be 8600 p.s.i. This was based on results of compressive tests reported in the book "Brick and Tile Engineering"[2]. The tests focused on brick from four separate geographical areas. The average compressive strength for the "New England" brick was 8600 p.s.i. Based on this compressive strength, the allowable compressive stress of 350 p.s.i. was taken from AASHTO's "Manual for Condition Evaluation of Bridges" Table 6.6.2.6. The Load Ratings have shown that each of the "Critical" bridges is capable of handling the vehicle loads required for this project. As long as speed restrictions and wheel edge distances are adhered to the allowable stress ranges of the bridges should not be exceeded. In addition to the load ratings prepared for this report, VHB obtained load ratings prepared by MassHighway for the vehicle bridges. Each of the bridges had an Operating Load of 49.5 tons. The five critical bridges are as follows:

Boylston Street
Agassiz Bridge
Netherlands Road
Jamaicaway Exit
Ward's Pond

Plummer, Harry C. *"Brick and Tile Engineering"* Structural Clay Products Institute Press

INVENTORY - MUDDY RIVER BRIDGES

BRIDGE NO.	LOCATION	HISTORICAL NAME	TRAFFIC	STRUCTURE TYPE	DATE BUILT	OWNER	LOAD RATING	OVERALL RATING	COMMENTS
B-16-018	Beacon Street	Beacon Street	Vehicle	Steel Girder w/ Façade	Re 1982	MassHighway Dept.	HS20	7	Originally built in 1900
B-16-176 3EV	Charlesgate (Comm. Ave. WB)	Charlesgate	Vehicle	Steel Girder w/ Façade	1917	MassHighway Dept.	HS20	6	
B-16-176 3EW	Charlesgate (Comm. Ave. EB)	Charlesgate	Vehicle	Steel Girder w/ Façade	1917	MassHighway Dept.	HS20	7	
B-16-360	I-90 (Massachusetts Turnpike)	Massachusetts Turnpike over Muddy River	Vehicle	Steel Girder	1965	Massachusetts Turnpike Authority	HS20		Bridge Not Accessible
	Railroad Crossing	Boston & Albany Railroad Bridge	Railroad	Steel Girder	1881	City of Boston			Combined Substr. w/ Ipswich St.
B-16-401	Ipswich Street	Ipswich Street	Vehicle	Steel Girder	1898	City of Boston	6 Ton Posted	3	Posted weight limits
B-16-188	Boylston Street	Richardson Bridge	Vehicle	Brick Arch w/ Façade	1881	Metropolitan District Commission	50 Ton "Critical"	7	
B-16-189	Agassiz Bridge	Agassiz Bridge	Vehicle	5-Span Masonry Arch	1887	City of Boston	50 Ton "Critical"	7	
	Back Bay to Fens #1	Jersey Street Bridge #1 Rose Garden Bridge	Pedestrian	C.I.P Arch w/ Façade		Boston Parks and Recreation Dept.		7	
	Back Bay to Fens #2	Jersey Street Bridge #2 MFA Bridge	Pedestrian	C.I.P Arch w/ Façade		Boston Parks and Recreation Dept.		7	
B-16-190	Avenue Louis Pasteur	Fens Bridge	Vehicle	Brick Arch w/ Façade	1889	City of Boston		7	Connects to culvert, drystack wall
	Riverway Access to MBTA	Chapel Street Bridge	Pedestrian	Brick Arch w/ Façade		City of Boston		8	
B-16-192	Longwood Ave.	Longwood Ave.	Vehicle	Granite Block Arch	1897	MassHighway Dept.	HS20	8	
B-16-193 = B-27-013	Netherlands Rd.	Bellevue Street	Vehicle	Brick Arch w/ Façade	1891	Boston Parks and Recreation Dept.	50 Ton "Critical"	7	
	Island Bridge #1	Footbridge East of Bellevue Street Bridge (Island Bridge #1)	Pedestrian	Brick Arch w/ Façade	1891	Town of Brookline		7	
	Island Bridge #2	Footbridge West of Brookline Ave (Island Bridge #2)	Pedestrian	Brick Arch w/ Façade	1891	Boston Parks and Recreation Dept.		7	
B-16-194	Brookline Ave.	Brookline Ave.	Vehicle	Brick Arch w/ Façade	1891	City of Boston	HS20	7	
B-27-012	US-1 Jamaicaway Exit	US-1 Jamaicaway Exit	Vehicle	C.I.P. Arch w/ Façade	1935	MassHighway Dept.	50 Ton "Critical"	7	
B-16-008 = B-27-009	Rte. 9 (Washington St.)	Washington St.	Vehicle	C.I.P Arch w/ Façade	1935	MassHighway Dept.	HS20	7	Culvert under roadways
	Cove Bridge	Cove Bridge	Pedestrian	Brick Arch w/ Façade	1894	Boston Parks and Recreation Dept.		7	
	Leverett Pond	Leverette Pond Masonry Structure	Pedestrian	Brick Arch w/ Façade	1892	Boston Parks and Recreation Dept.		7	
B-16-195	Willow Pond Road	Willow Pond (Masonry Structures No. 2 & No. 3)	Vehicle	Masonry Culvert	1892	Boston Parks and Recreation Dept.	HS20	6	
	Willow Pond #2	Willow Pond (Masonry Structure No. 4)	Pedestrian	Brick Arch w/ Façade	1892	Boston Parks and Recreation Dept.		7	
	Ward's Pond	Ward's Pond Bridge	Pedestrian	Brick Arch w/ Façade	1892	Boston Parks and Recreation Dept.	50 Ton "Critical"	7	

Table 1

VI. PROJECT RECOMMENDATIONS

VHB recommends that CDM proceed with their proposed enhancements along the Muddy River adhering to the conditions stipulated herein.

The limits of the natural soil shall be determined through a comprehensive subsurface exploration program. Once the "Natural Soils" elevations have been determined they shall be compared with the riverbed elevations determined from existing bridge drawings. The higher of the two elevations shall be used to set the bottom of riverbed elevation. In the event that no existing elevations have been determined, the elevations determined by CDM's borings shall be used. The riverbeds shall be graded as shown in the drawings located in Appendix B.

It is important to note that the elevations shown on the sketches are taken from existing drawings. None of these drawings reference what datum was used to set these elevations. When comparing the natural soil elevation determined by the borings and the elevations shown on the plans the dredger must first determine if they are on the same datum. This can be accomplished by comparing elevations on the bridges to the sketches with elevations determined from the survey.

During site visits it was noted that many of the stone bridges need repointing, especially at the water level. The only rehabilitation proposed at this time would be:

- Repointing of Masonry
- Washing Existing Stones
- Replacing any Missing Stones
- Bringing Railing up to current AASHTO Code
- Removing vegetation at bridge fascia
- Repairing pavement or walk surfaces
- Repairing bridge joints

Table 2 shows the specific repairs relating to each individual bridge.

The five critical bridges can be used to transport dredging equipment and dredged materials as long as the speed limit restrictions and clearances specified in the Existing Field Conditions section of the report are met. Only these five bridges can be used to transport materials. Vehicle bridges not rated for the 50-ton trailer dump may not be used for loads greater than H-20. None of the other pedestrian bridges may be used to transport any materials or equipment without written approval from the bridge owner or VHB. Under no circumstances shall vehicles weighing more than 50 tons be driven over the critical bridges.

SUGGESTED REHABILITATION - MUDDY RIVER BRIDGES

BRIDGE NO.	HISTORICAL NAME	REPOINTING MASONRY	WASHING STONES	REPLACE MISSING STONES	UPGRADE RAILING	REMOVE VEGETATION	REPAIR WALK SURFACES	REPAIR BRIDGE JOINTS	COMMENTS
B-16-018	Beacon Street				X			X	
B-16-176 3EV	Charlesgate								
B-16-176 3EW	Charlesgate								
B-16-360	Massachusetts Turnpike over Muddy River								
	Boston & Albany Railroad Bridge								
B-16-401	Ipswich Street								The entire bridge needs serious work
B-16-188	Richardson Bridge		X						Repair crack in barrel at west side
B-16-189	Agassiz Bridge	X				X			
	Jersey Street Bridge #1 Rose Garden Bridge								
	Jersey Street Bridge #2 MFA Bridge						X		
B-16-190	Fens Bridge					X			
	Chapel Street Bridge		X						
B-16-192	Longwood Ave.								
B-16-193 = B-27-013	Bellevue Street	X							
	Footbridge East of Bellevue Street Bridge (Island Bridge #1)	X							
	Footbridge West of Brookline Ave (Island Bridge #2)	X				X			
B-16-194	Brookline Ave.	X							
B-27-012	US-1 Jamaicaway Exit								
B-16-008 = B-27-009	Washington St.	X							
	Cove Bridge	X				X			
	Leverette Pond Masonry Structure								
B-16-195	Willow Pond (Masonry Structures No. 2 & No. 3)								
	Willow Pond (Masonry Structure No. 4)								
	Ward's Pond Bridge	X		X					

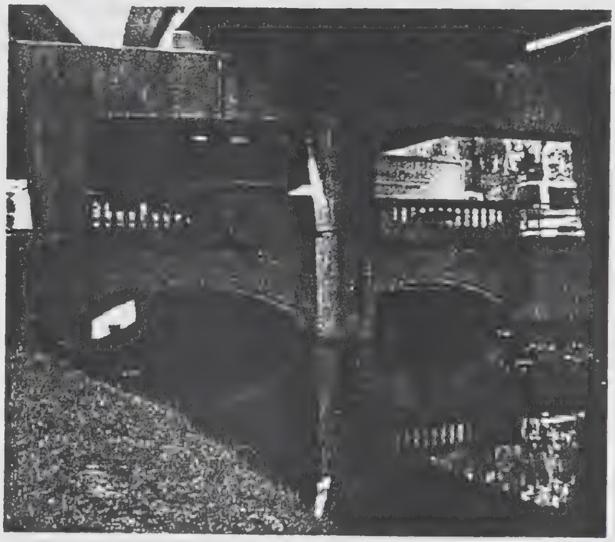
Table 2

PPENDIX A – INVENTORY FORMS

MUDDY RIVER-BRIDGE INVENTORY

NSPECTOR(S): BRANT BALLANTYNE INSPECTION DATE: 6/9/00

RAL INFORMATION



ITY/TOWN: BOSTON

RIDGE NAME: BEACON STREET

RIDGE NUMBER: B-16-018

RIDGE OWNER: MHD

RIDGE TYPE: STEEL GIRDER W/ FAÇADE

RIDGE USAGE: VEHICLE

ATE OF CONSTRUCTION: 1900

ATE(S) OF REHABILITATION: 1982

VER: BEACON STREET

NDER: MUDDY RIVER

E GEOMETRY

TAL LENGTH: 32 (FT) 0 (IN)

JMBER OF SPANS: 2 @ 16 (FT) 0 (IN)

JMBER OF PIERS: 1

RIDGE WIDTH: (OUT-TO-OUT) 50 (FT) 0 (IN)

JMBER OF TRAVEL LANES: 3 IN ONE DIRECTION

JMBER OF SIDEWALKS: 2 @ 12 (FT) 0 (IN)

EDIAN: (~~YES~~/NO) (FT) (IN)

PE OF RAILING: CONCRETE W/ ORNAMENTAL SPINDELS

PE OF FENCING: N/A

TURAL CONDITION

GENERAL	CONDITION
PROACH	7
CK/TOPPING	7
OSION	
OUR	
ILING	6
INT	

ABUTMENTS	CONDITION (1)	CONDITION (2)
STEM	6	6
WINGWALLS	6	6
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING		
FOOTING		
SETTLEMENT		

PIERS	CONDITION
PILES	
FOOTINGS	
PIER PROTECTION	
STEM OR COLUMNS	
CAP BEAMS	
PEDESTALS	
DIAGONAL BRACING	
SETTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	NOT ACCESIBLE
BOTTOM FLANGE	NOT ACCESIBLE
WEB	NOT ACCESIBLE
STIFFENERS	NOT ACCESIBLE
RIVETS/BOLTS	NOT ACCESIBLE
WELDS	NOT ACCESIBLE
GUSSETS	NOT ACCESIBLE
DIAPHRAGMS	NOT ACCESIBLE

ARCH BRIDGES	CONDITION
KEYSTONE AREA	
ARCH RING	
SPRINGLINE	
SPANDREL WALLS	
FAÇADE	
FOOTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	6

RATING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY
5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL
1-IMMINENT FAILURE
0-FAILURE

REMARKS

RAILING ON SOUTHSIDE IS MISSING SPINDELS

EAST ABUTMENT HAS A LARGE CRACKED AREA UNDER A BEAM SEAT

SIGNED ____________________ INSPECTOR

REVIEWED ____________________ SUPERVISOR

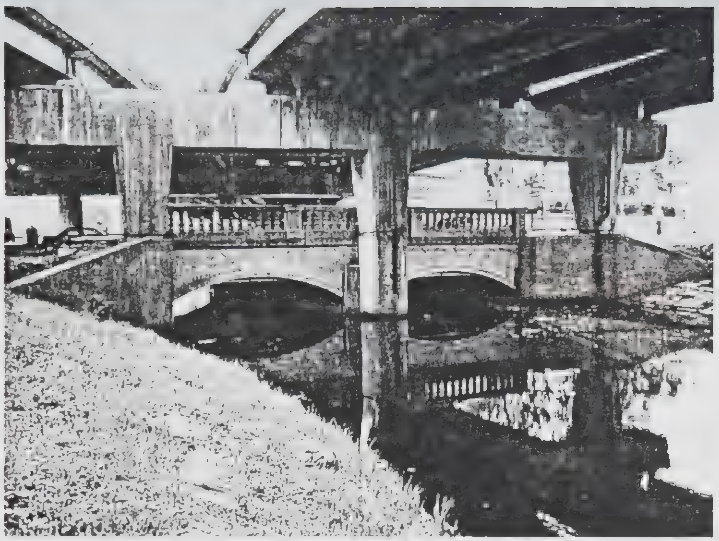


Figure 1: Downstream Elevation

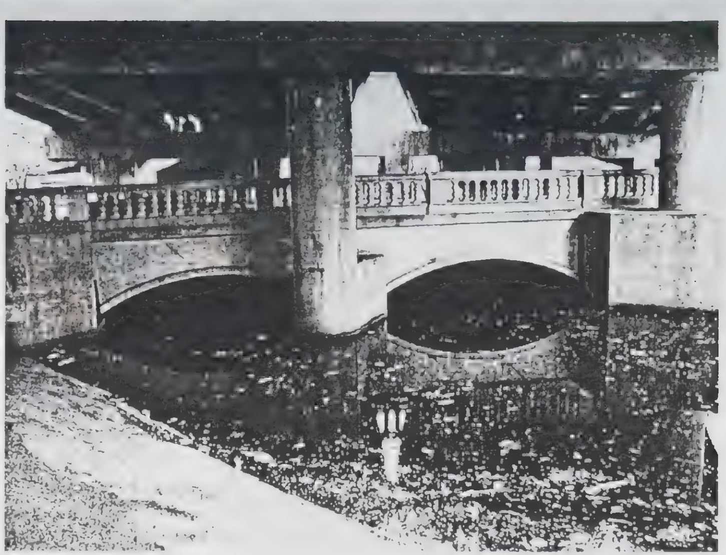


Figure 2: Upstream elevation

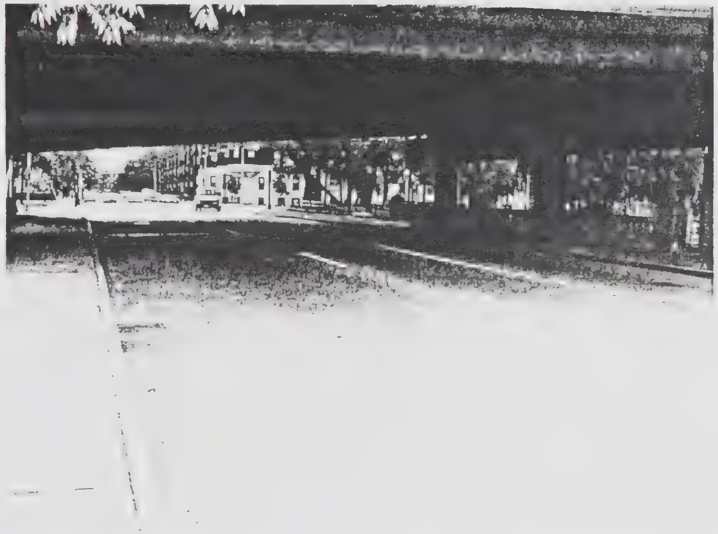


Figure 3: West Approach

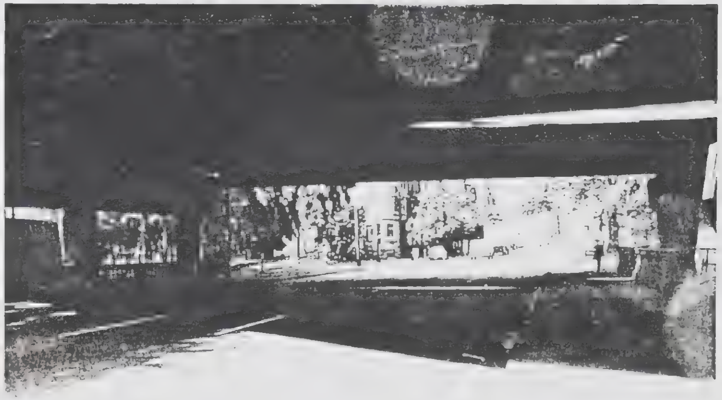
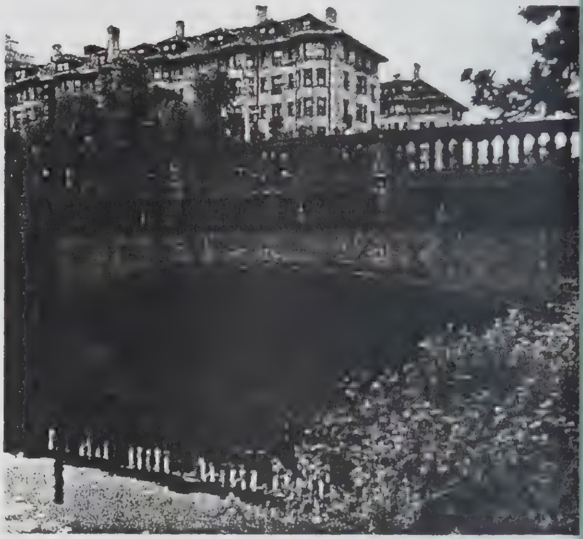


Figure 4: East Approach

MUDDY RIVER-BRIDGE INVENTORY

INSPECTOR(S): Brant Ballantyne INSPECTION DATE: 6/9/00

GENERAL INFORMATION



CITY/TOWN: Boston

BRIDGE NAME: Charlesgate (Comm. Ave WB)

BRIDGE NUMBER: B-16-176

BRIDGE OWNER: MHD

BRIDGE TYPE: Steel Girder w/ Façade

BRIDGE USAGE: Vehicle

DATE OF CONSTRUCTION: 1917

DATE(S) OF REHABILITATION:

OVER: Commonwealth Ave Westbound

UNDER: Muddy River

BRIDGE GEOMETRY

TOTAL LENGTH: 60 (FT) 0 (IN)

NUMBER OF SPANS: 1 @ 60 (FT) 0 (IN)

NUMBER OF PIERS: 0

BRIDGE WIDTH: (OUT-TO-OUT) 70 (FT) 0 (IN)

NUMBER OF TRAVEL LANES: 3 in one direction

NUMBER OF SIDEWALKS: 2 @ 15 (FT) 0 (IN)

MEDIAN: (~~YES~~/NO) (FT) (IN)

TYPE OF RAILING: Concrete w/ Ornamental Spindels

TYPE OF FENCING: N/A

STRUCTURAL CONDITION

GENERAL	CONDITION
APPROACH	7
DECK/TOPPING	7
EROSION	
SCOUR	
RAILING	5
PAINT	

ABUTMENTS	CONDITION (1)	CONDITIO
STEM	5	7
WINGWALLS	6	6
PEDESTALS		
BRIDGE SEATS	6	6
PARAPET	6	6
POINTING		
FOOTING		
SETTLEMENT		

PIERS	CONDITION
ILES	
OOTINGS	
IER PROTECTION	
TEM OR COLUMNS	
AP BEAMS	
EDESTALS	
IAGONAL BRACING	
ETTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	NOT ACCESIBLE
BOTTOM FLANGE	NOT ACCESIBLE
WEB	NOT ACCESIBLE
STIFFENERS	NOT ACCESIBLE
RIVETS/BOLTS	NOT ACCESIBLE
WELDS	NOT ACCESIBLE
GUSSETS	NOT ACCESIBLE
DIAPHRAGMS	NOT ACCESIBLE

ARCH BRIDGES	CONDITION
EYSTONE AREA	
RCH RING	
PRINGLINE	
PANDREL WALLS	
AÇADE	
OOTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	7

ATING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY
5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL
1-IMMINENT FAILURE
0-FAILURE

KS

SIGNED ______________ INSPECTOR

REVIEWED Will. [illegible] SUPERVISOR

CHARLESGATE (COMMONWEALTH AVENUE WEST BOUND)

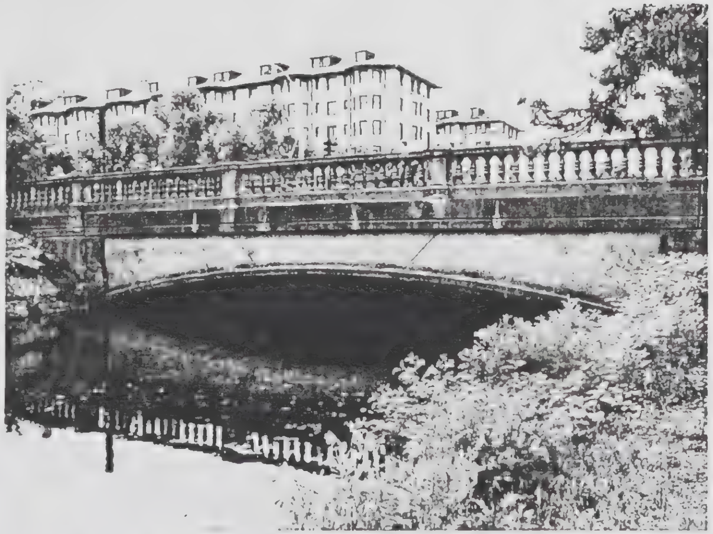


Figure 5: Downstream Elevation

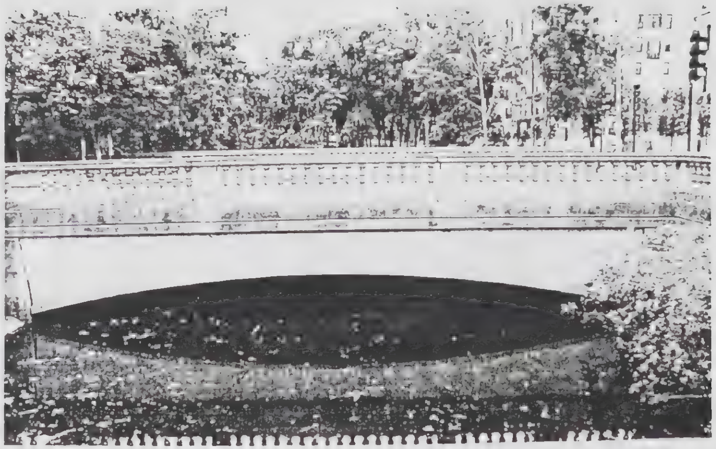


Figure 6: Upstream Elevation

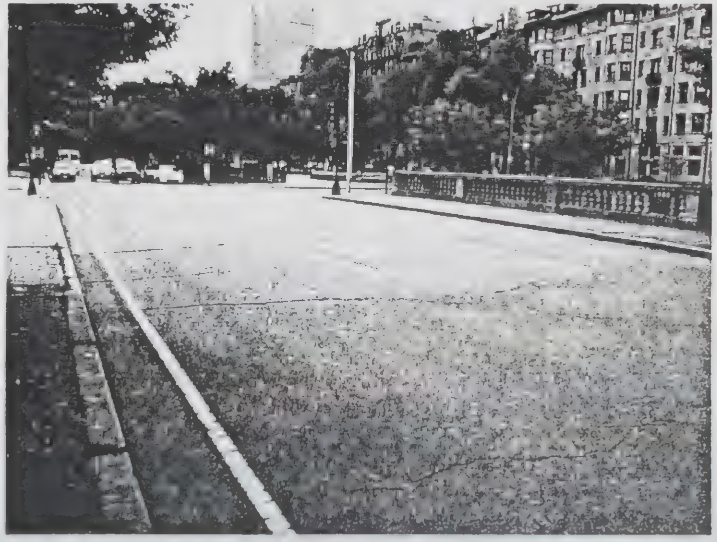


Figure 7: West Approach

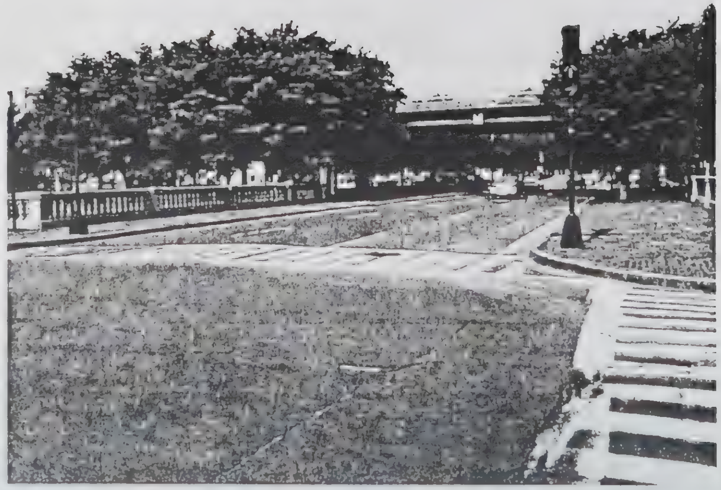
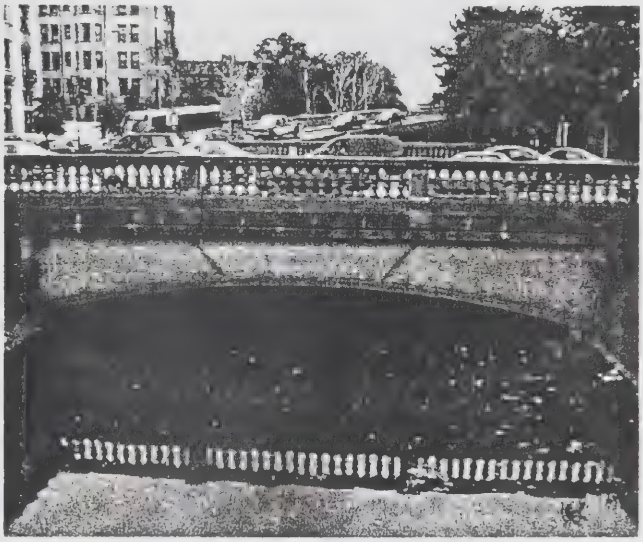


Figure 8: East Approach

MUDDY RIVER-BRIDGE INVENTORY

NSPECTOR(S): Brant Ballantyne INSPECTION DATE: 6/9/00

RAL INFORMATION



ITY/TOWN: Boston

RIDGE NAME: Charlesgate (Comm. Ave EB)

RIDGE NUMBER: B-16-176

RIDGE OWNER: MHD

RIDGE TYPE: Steel Girder w/ Façade

RIDGE USAGE: Vehicle

ATE OF CONSTRUCTION: 1917

ATE(S) OF REHABILITATION:

VER: Commonwealth Ave Eastbound

NDER: Muddy River

E GEOMETRY

OTAL LENGTH: 60 (FT) 0 (IN)

UMBER OF SPANS: 1 @ 60 (FT) 0 (IN)

UMBER OF PIERS: 0

RIDGE WIDTH: (OUT-TO-OUT) 78 (FT) 0 (IN)

UMBER OF TRAVEL LANES: 4

UMBER OF SIDEWALKS: 2 @ 13 (FT) 0 (IN)

EDIAN: (~~YES~~/NO) (FT) (IN)

YPE OF RAILING: Concrete w/ Ornamental Spindels

YPE OF FENCING: N/A

CTURAL CONDITION

GENERAL	CONDITION
PPROACH	7
ECK/TOPPING	7
ROSION	
COUR	
AILING	5
AINT	

ABUTMENTS	CONDITION (1)	CONDITION (2)
STEM	7	NOT VISIBLE
WINGWALLS	7	7
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING		
FOOTING		
SETTLEMENT	7	7

PIERS	CONDITION
PILES	
FOOTINGS	
PIER PROTECTION	
STEM OR COLUMNS	
CAP BEAMS	
PEDESTALS	
DIAGONAL BRACING	
SETTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	NOT ACCESIBLE
BOTTOM FLANGE	NOT ACCESIBLE
WEB	NOT ACCESIBLE
STIFFENERS	NOT ACCESIBLE
RIVETS/BOLTS	NOT ACCESIBLE
WELDS	NOT ACCESIBLE
GUSSETS	NOT ACCESIBLE
DIAPHRAGMS	NOT ACCESIBLE

ARCH BRIDGES	CONDITION
KEYSTONE AREA	
ARCH RING	
SPRINGLINE	
SPANDREL WALLS	
FAÇADE	
FOOTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	7

RATING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY
5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL
1-IMMINENT FAILURE
0-FAILURE

REMARKS

SIGNED ________________ INSPECTOR

REVIEWED ________________ SUPERVISOR

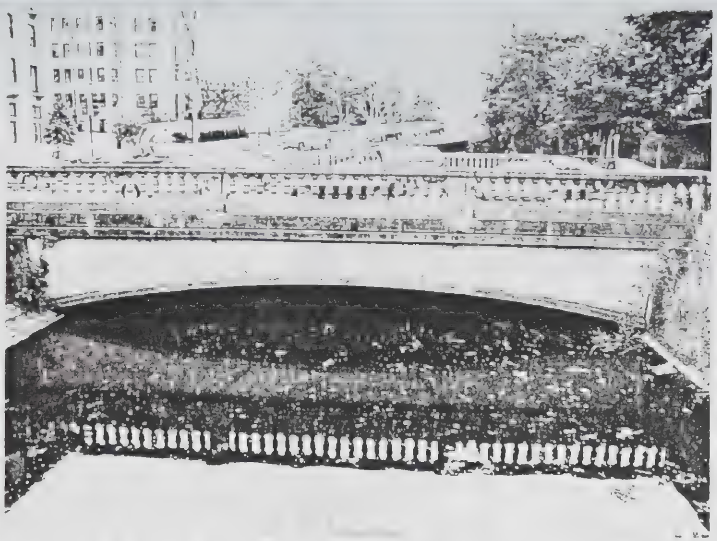


Figure 9: Downstream Elevation

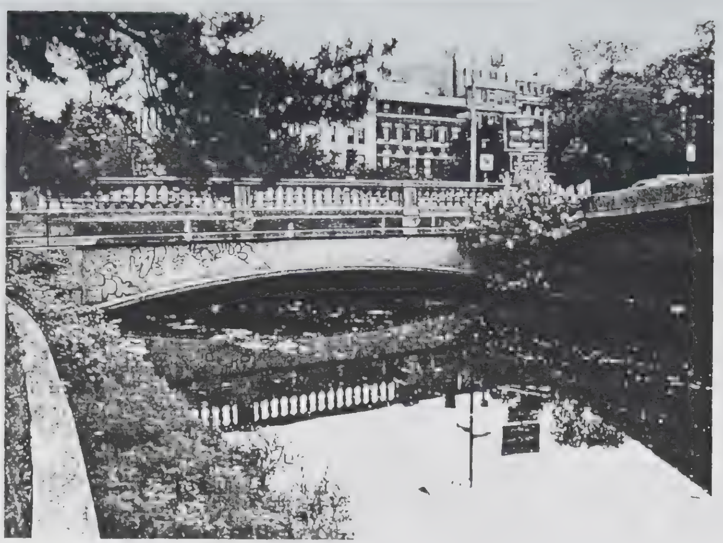


Figure 10: Upstream Elevation

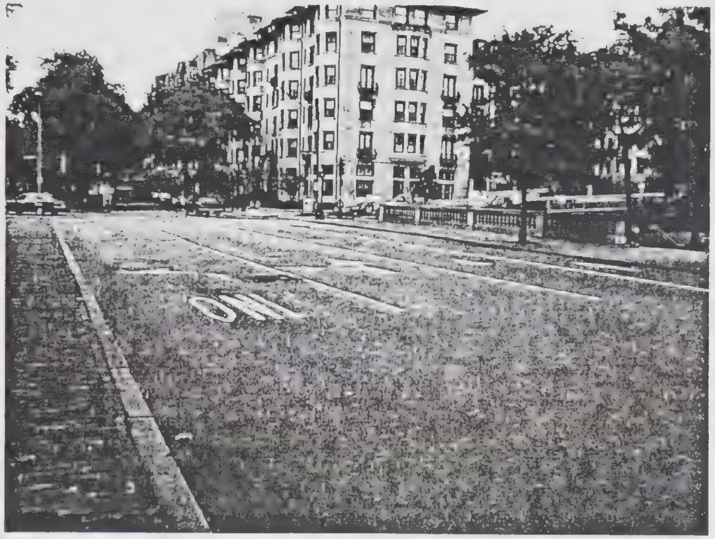


Figure 11: West Approach

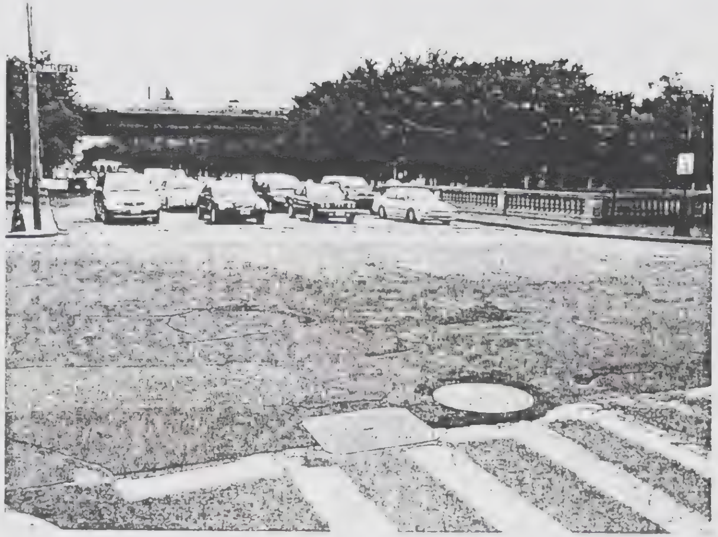


Figure 12: East Approach

MUDDY RIVER-BRIDGE INVENTORY

INSPECTOR(S): Brant Ballantyne INSPECTION DATE: 6/9/00

GENERAL INFORMATION

CITY/TOWN: Boston

BRIDGE NAME: Ipswich Street

BRIDGE NUMBER: B-16-401

BRIDGE OWNER: City of Boston

BRIDGE TYPE: Steel Girder

BRIDGE USAGE: Vehicle

DATE OF CONSTRUCTION: 1898

DATE(S) OF REHABILITATION:

OVER: Ipswich Street

UNDER: Muddy River

BRIDGE GEOMETRY

TOTAL LENGTH: 46 (FT) 6 (IN)

NUMBER OF SPANS: 3 @ 15 (FT) 6 (IN)

NUMBER OF PIERS: 2

BRIDGE WIDTH: (OUT-TO-OUT) 40 (FT) 0 (IN)

NUMBER OF TRAVEL LANES: 3

NUMBER OF SIDEWALKS: 1 @ 7 (FT) 0 (IN)

MEDIAN: (~~YES~~/NO) (FT) (IN)

TYPE OF RAILING: Steel pipe on south side

TYPE OF FENCING: 6' Chain link on north side

STRUCTURAL CONDITION

GENERAL	CONDITION
APPROACH	6
DECK/TOPPING	6
EROSION	
SCOUR	
RAILING	4
PAINT	

ABUTMENTS	CONDITION (I)	CONDITIO
STEM	6	6
WINGWALLS	6	6
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING		
FOOTING		
SETTLEMENT	6	6

PIERS	CONDITION
ILES	6
OOTINGS	
IER PROTECTION	
TEM OR COLUMNS	
AP BEAMS	
EDESTALS	
IAGONAL BRACING	
ETTLEMENT	6

GIRDERS	CONDITION
TOP FLANGE	NOT ACCESIBLE
BOTTOM FLANGE	NOT ACCESIBLE
WEB	NOT ACCESIBLE
STIFFENERS	NOT ACCESIBLE
RIVETS/BOLTS	NOT ACCESIBLE
WELDS	NOT ACCESIBLE
GUSSETS	NOT ACCESIBLE
DIAPHRAGMS	NOT ACCESIBLE

ARCH BRIDGES	CONDITION
EYSTONE AREA	
RCH RING	
PRINGLINE	
PANDREL WALLS	
AÇADE	
OOTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	3*

ATING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY
5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL
1-IMMINENT FAILURE
0-FAILURE

KS

ONCRETE DECK IS FULL DEPTH OF GIRDERS
SERIOUS" RATING IS BASED ON INSPECTION REPORTS PREPARED BY MASSHIGHWAY
RIDGE IS POSTED FOR 6 TONS

SIGNED ______________ INSPECTOR

REVIEWED ______________ SUPERVISOR

ISPWICH STREET

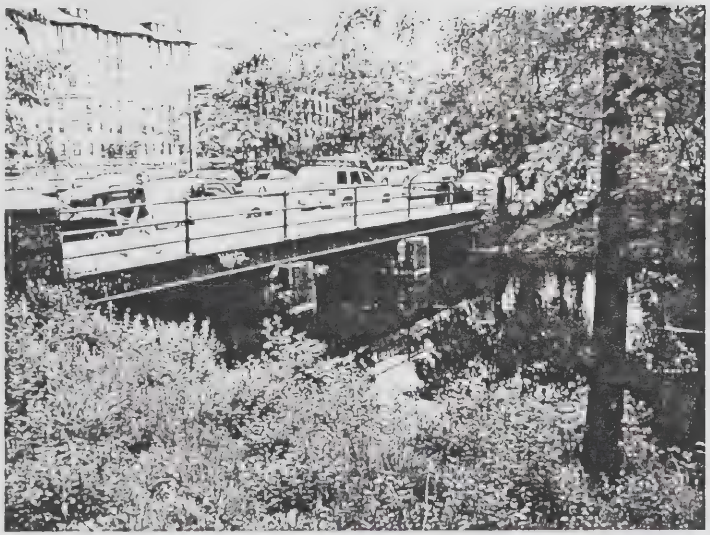


Figure 13: Upstream Elevation

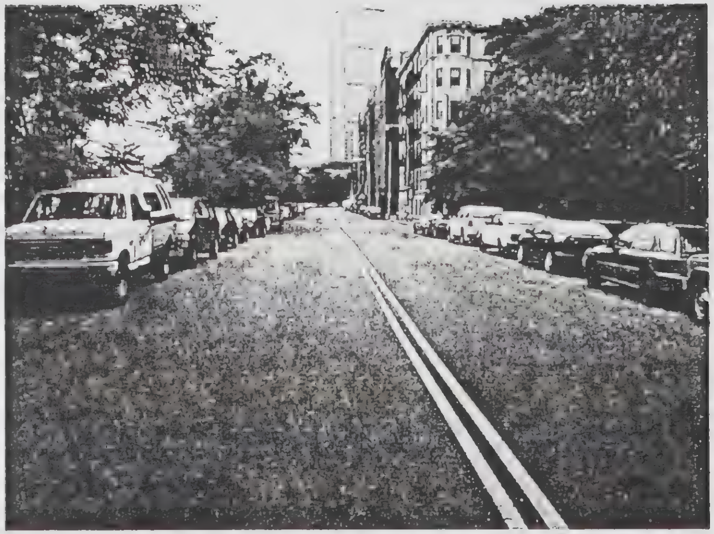
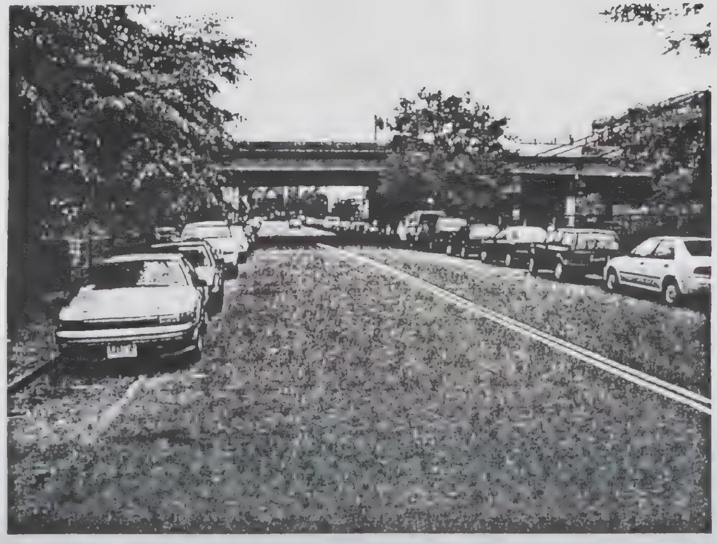


Figure 14: West Approach



MUDDY RIVER-BRIDGE INVENTORY

NSPECTOR(S): BRANT BALLANTYNE INSPECTION DATE: 6/9/00

RAL INFORMATION

ITY/TOWN: BOSTON

RIDGE NAME: BOYLSTON STREET

RIDGE NUMBER: B-16-188

RIDGE OWNER: MDC

RIDGE TYPE: BRICK ARCH W/ FAÇADE

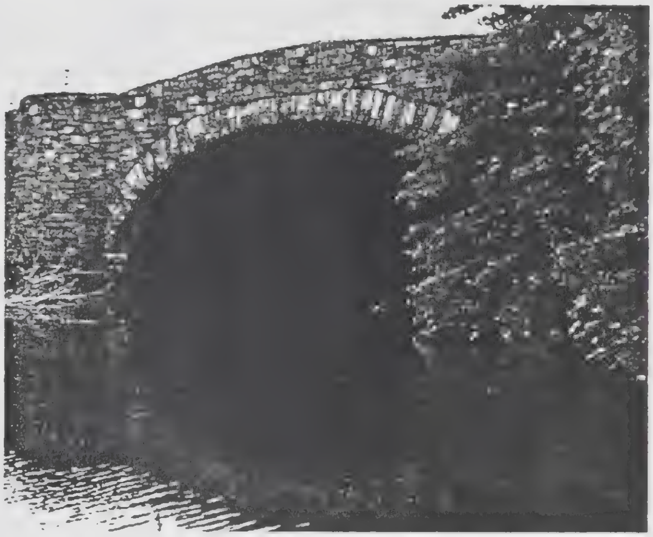
RIDGE USAGE: VEHICLE

ATE OF CONSTRUCTION: 1881

ATE(S) OF REHABILITATION:

VER: BOYLSTON STREET

NDER: MUDDY RIVER



E GEOMETRY

OTAL LENGTH: 60 (FT) 0 (IN)

UMBER OF SPANS: 1 @ 60 (FT) 0 (IN)

UMBER OF PIERS:

RIDGE WIDTH: (OUT-TO-OUT) VARIES (FT) (IN)

UMBER OF TRAVEL LANES: 5

UMBER OF SIDEWALKS: 2 @ 7 (FT) 0 (IN)

EDIAN: (YES/~~NO~~) 5 (FT) 0 (IN)

YPE OF RAILING: STONE MASONRY

YPE OF FENCING:

TURAL CONDITION

GENERAL	CONDITION
PPROACH	7
ECK/TOPPING	7
ROSION	
COUR	
AILING	7
AINT	

ABUTMENTS	CONDITION (1)	CONDITION (2)
STEM		
WINGWALLS	8	8
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING		
FOOTING		
SETTLEMENT	7	7

PIERS	CONDITION
PILES	
FOOTINGS	
PIER PROTECTION	
STEM OR COLUMNS	
CAP BEAMS	
PEDESTALS	
DIAGONAL BRACING	
SETTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	
BOTTOM FLANGE	
WEB	
STIFFENERS	
RIVETS/BOLTS	
WELDS	
GUSSETS	
DIAPHRAGMS	

ARCH BRIDGES	CONDITION
KEYSTONE AREA	7
ARCH RING	7
SPRINGLINE	6
SPANDREL WALLS	8
FAÇADE	7
FOOTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	7

RATING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY

5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL

1-IMMINENT FAILURE
0-FAILURE

REMARKS

Large crack starting at springline near midspan of west side
Effluecence at barrel façade

SIGNED ______ INSPECTOR

REVIEWED Walt Vance SUPERVISOR

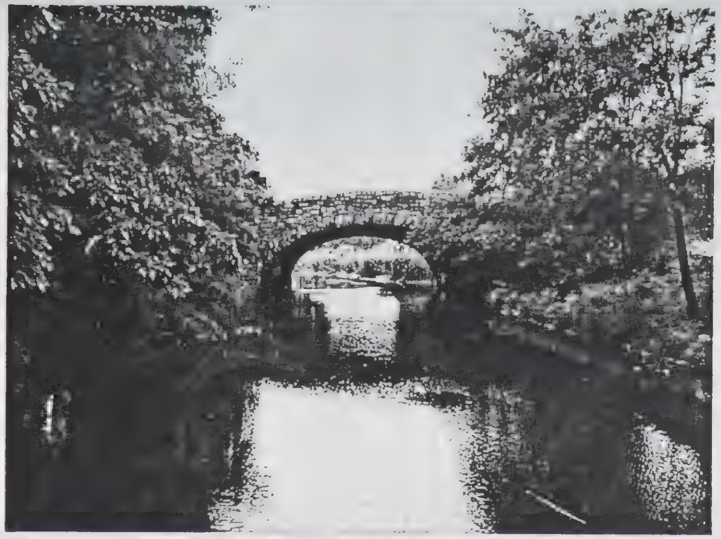


Figure 16: Downstream Elevation

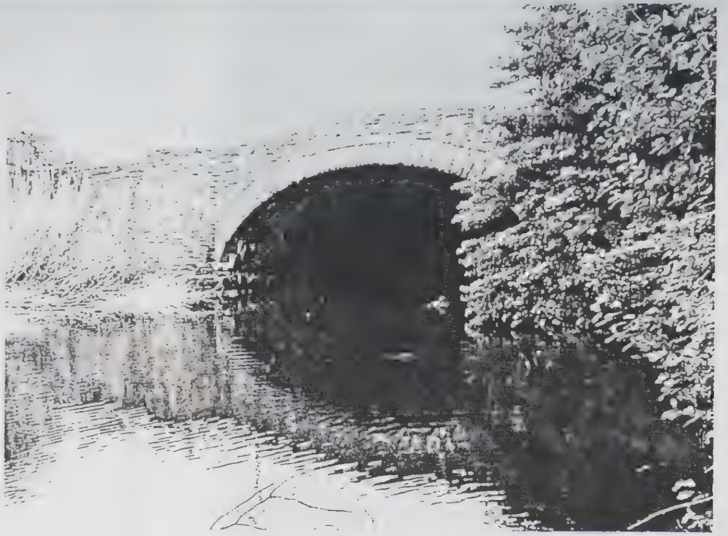


Figure 17: Upstream Elevation

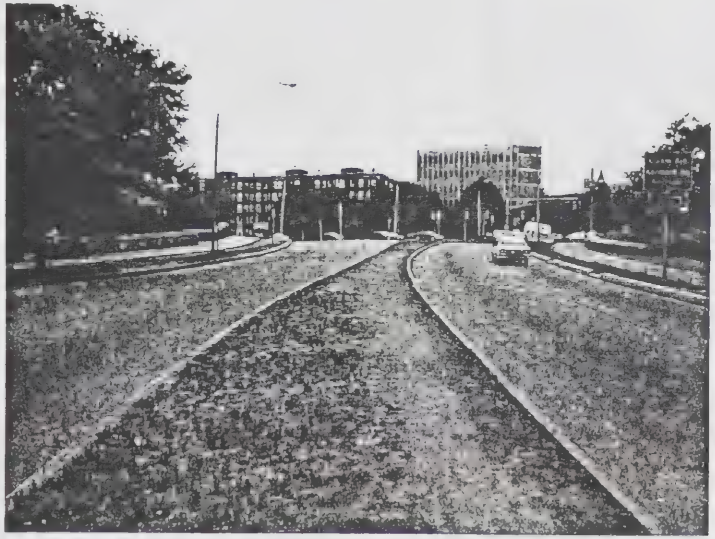


Figure 18: East Approach

MUDDY RIVER-BRIDGE INVENTORY

INSPECTOR(S): BRANT BALLANTYNE INSPECTION DATE: 6/9/00

GENERAL INFORMATION

CITY/TOWN: BOSTON

BRIDGE NAME: AGASSIZ BRIDGE

BRIDGE NUMBER: B-16-189

BRIDGE OWNER: CITY OF BOSTON

BRIDGE TYPE: 5-SPAN BRICK ARCH W/ FAÇADE

BRIDGE USAGE: VEHICLE

DATE OF CONSTRUCTION: 1887

DATE(S) OF REHABILITATION:

OVER: AGASSIZ ROAD

UNDER: MUDDY RIVER

BRIDGE GEOMETRY

TOTAL LENGTH: 67 (FT) 0 (IN)

NUMBER OF SPANS: 5 @ VARIES 9-12 (FT)

NUMBER OF PIERS: 4

BRIDGE WIDTH: (OUT-TO-OUT) VARIES (FT) (IN)

NUMBER OF TRAVEL LANES: 1

NUMBER OF SIDEWALKS: 2 @ 6 (FT) 0 (IN)

MEDIAN: (~~YES~~/NO) 5 (FT) 0 (IN)

TYPE OF RAILING: STONE MASONRY

TYPE OF FENCING:

STRUCTURAL CONDITION

GENERAL	CONDITION
APPROACH	7
DECK/TOPPING	7
EROSION	
SCOUR	
RAILING	7
PAINT	

ABUTMENTS	CONDITION (I)	CONDITIO
STEM		
WINGWALLS	6	6
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING		
FOOTING		
SETTLEMENT	7	7

PIERS	CONDITION
ILES	
OOTINGS	
IER PROTECTION	
TEM OR COLUMNS	
AP BEAMS	
EDESTALS	
IAGONAL BRACING	
ETTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	
BOTTOM FLANGE	
WEB	
STIFFENERS	
RIVETS/BOLTS	
WELDS	
GUSSETS	
DIAPHRAGMS	

ARCH BRIDGES	CONDITION
EYSTONE AREA	7
RCH RING	7
PRINGLINE	6
ANDREL WALLS	6
AÇADE	6
OOTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	7

ATING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY

5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL

1-IMMINENT FAILURE
0-FAILURE

RKS

EAVY MORTAR LOSS AT WATER LEVEL OF PIERS
ARGE AMOUNTS OF VEGETATION THROUGH PIERS AND WALLS
AILING IS TOO LOW FOR AASHTO PEDESTRIAN REQUIREMENTS

SIGNED ________________ INSPECTOR

REVIEWED ________________ SUPERVISOR

AGASSIZ BRIDGE

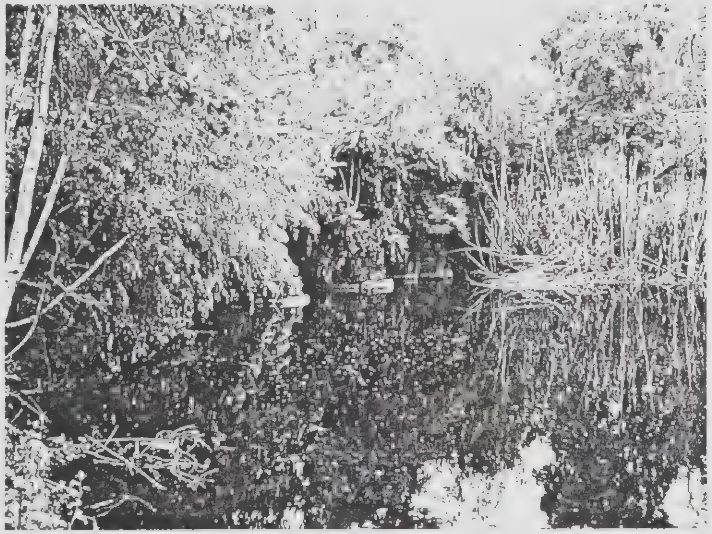


Figure 19: Upstream Elevation

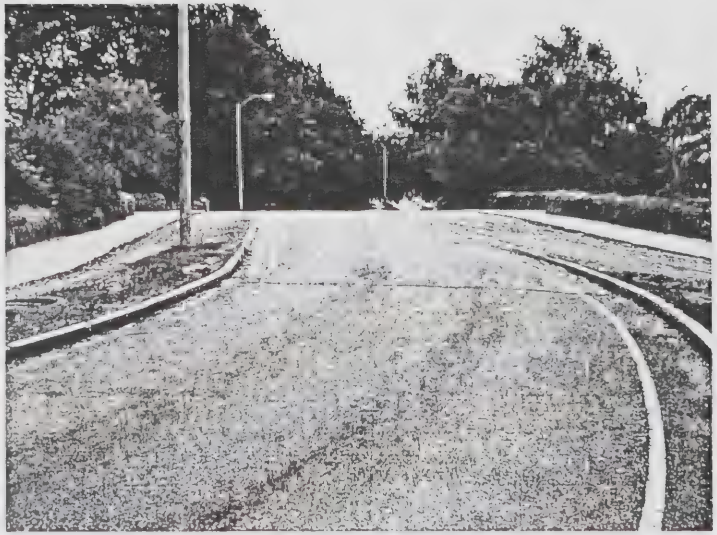


Figure 20: West Approach

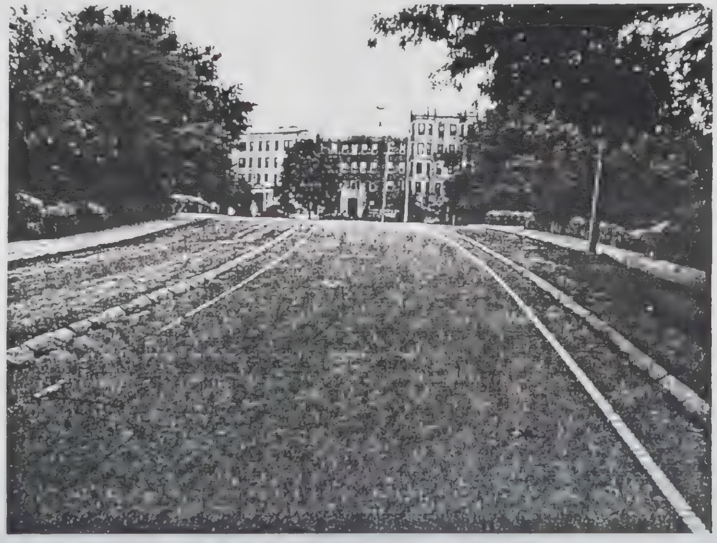


Figure 21: East Approach

MUDDY RIVER-BRIDGE INVENTORY

SPECTOR(S): Brant Ballantyne INSPECTION DATE: 6/9/00

AL INFORMATION

TY/TOWN: Boston

RIDGE NAME: Backbay - Fens #1

RIDGE NUMBER:

RIDGE OWNER: Boston Parks & Rec. Dept.

RIDGE TYPE: C-I-P Conc. Arch W/ Façade

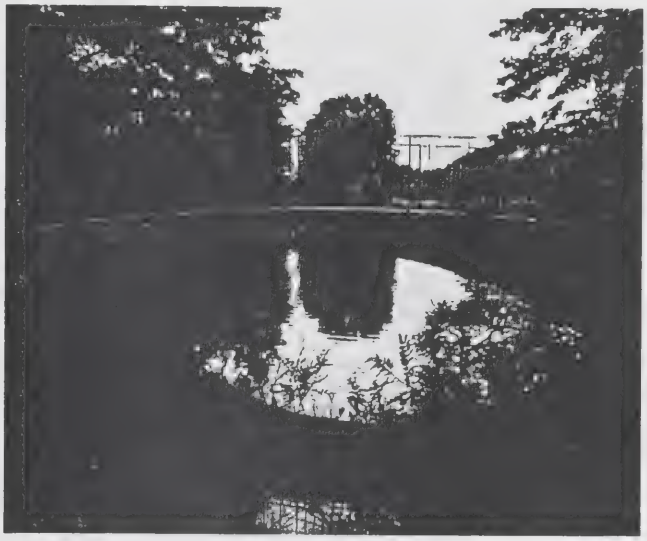
RIDGE USAGE: Pedestrian

TE OF CONSTRUCTION:

TE(S) OF REHABILITATION:

ER: Backbay - Fens Pedestrian Walkway

DER: Muddy River



GEOMETRY

TAL LENGTH: 50 (FT) 0 (IN)

MBER OF SPANS: 1 @ 50 (FT) 0 (IN)

MBER OF PIERS:

IDGE WIDTH: (OUT-TO-OUT) 8 (FT) 0 (IN)

MBER OF TRAVEL LANES:

MBER OF SIDEWALKS: 1 @ 5 (FT) 0 (IN)

EDIAN: (~~YES~~/NO) (FT) (IN)

PE OF RAILING: Steel

PE OF FENCING:

TURAL CONDITION

GENERAL	CONDITION
PROACH	7
CK/TOPPING	7
OSION	6
OUR	
ILING	7
INT	7

ABUTMENTS	CONDITION (1)	CONDITION (2)
STEM		
WINGWALLS	7	7
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING	8	8
FOOTING		
SETTLEMENT	7	7

PIERS	CONDITION
PILES	
FOOTINGS	
PIER PROTECTION	
STEM OR COLUMNS	
CAP BEAMS	
PEDESTALS	
DIAGONAL BRACING	
SETTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	
BOTTOM FLANGE	
WEB	
STIFFENERS	
RIVETS/BOLTS	
WELDS	
GUSSETS	
DIAPHRAGMS	

ARCH BRIDGES	CONDITION
KEYSTONE AREA	8
ARCH RING	8
SPRINGLINE	6
SPANDREL WALLS	8
FAÇADE	8
FOOTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	7

RATING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY
5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL
1-IMMINENT FAILURE
0-FAILURE

REMARKS

SIGNED ____________ INSPECTOR

REVIEWED ____________ SUPERVISOR

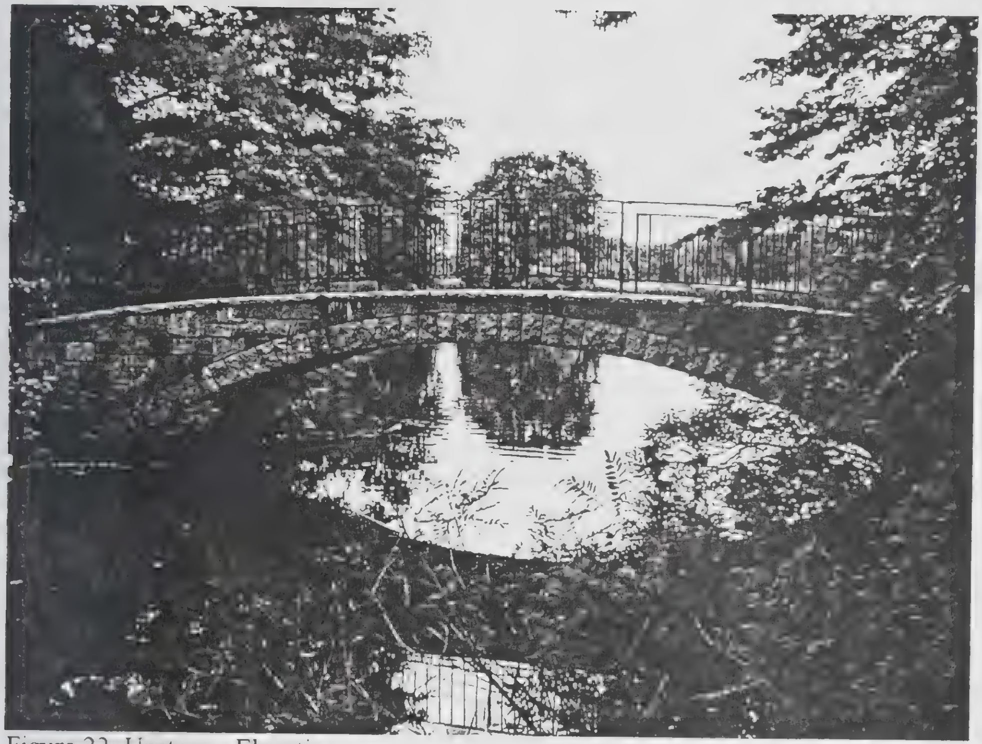


Figure 22: Upstream Elevation

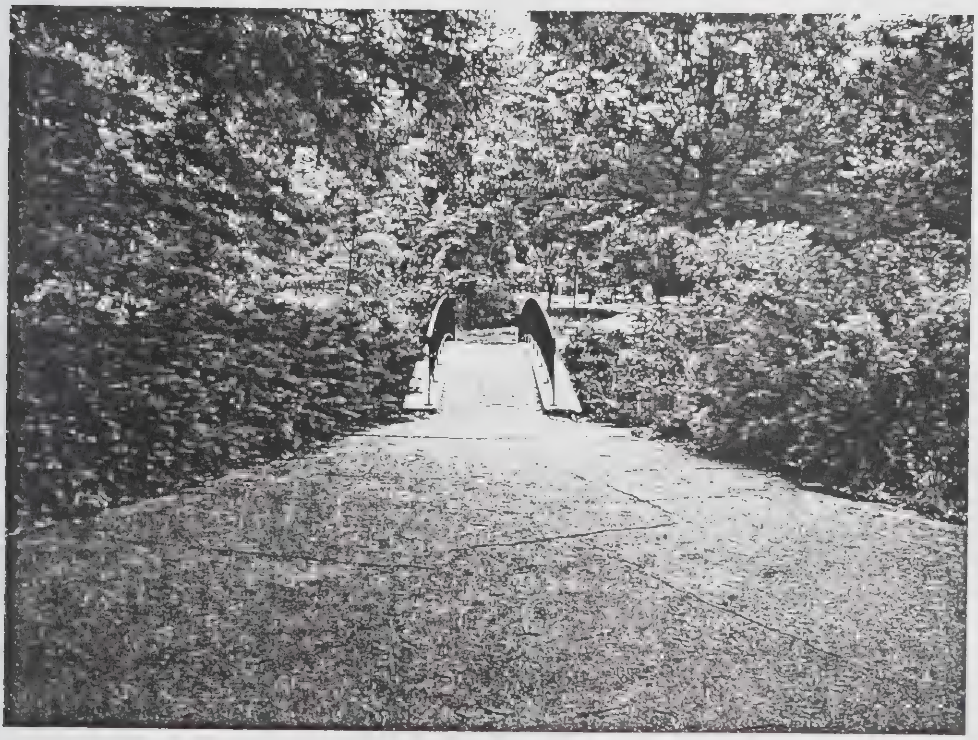
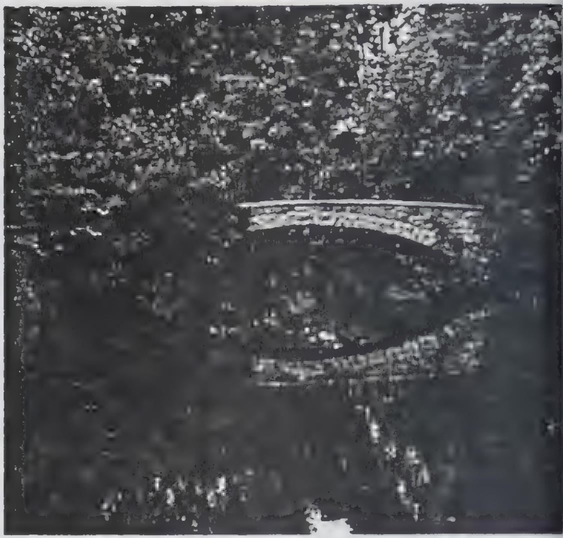


Figure 23: West Approach

MUDDY RIVER-BRIDGE INVENTORY

INSPECTOR(S): Brant Ballantyne INSPECTION DATE: 6/9/00

GENERAL INFORMATION



CITY/TOWN: Boston

BRIDGE NAME: Backbay - Fens #2

BRIDGE NUMBER:

BRIDGE OWNER: Boston Parks & Rec. Dept.

BRIDGE TYPE: C-I-P Conc. Arch W/ Façade

BRIDGE USAGE: Pedestrian

DATE OF CONSTRUCTION:

DATE(S) OF REHABILITATION:

OVER: Backbay - Fens Pedestrian Walkway

UNDER: Muddy River

BRIDGE GEOMETRY

TOTAL LENGTH: 25 (FT) (IN)

NUMBER OF SPANS: 1 @ 25 (FT) (IN)

NUMBER OF PIERS:

BRIDGE WIDTH: (OUT-TO-OUT) 8 (FT) 0 (IN)

NUMBER OF TRAVEL LANES:

NUMBER OF SIDEWALKS: 1 @ 5 (FT) 0 (IN)

MEDIAN: (~~YES~~/NO) (FT) (IN)

TYPE OF RAILING: Steel

TYPE OF FENCING:

STRUCTURAL CONDITION

GENERAL	CONDITION
APPROACH	6
DECK/TOPPING	6
EROSION	7
SCOUR	
RAILING	7
PAINT	7

ABUTMENTS	CONDITION (I)	CONDITIO
STEM		
WINGWALLS	7	7
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING	8	8
FOOTING		
SETTLEMENT	7	7

PIERS	CONDITION
ILES	
OOTINGS	
ER PROTECTION	
TEM OR COLUMNS	
AP BEAMS	
EDESTALS	
AGONAL BRACING	
ETTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	
BOTTOM FLANGE	
WEB	
STIFFENERS	
RIVETS/BOLTS	
WELDS	
GUSSETS	
DIAPHRAGMS	

ARCH BRIDGES	CONDITION
EYSTONE AREA	8
RCH RING	8
PRINGLINE	7
PANDREL WALLS	8
AÇADE	8
OOTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	7

ATING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY
5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL
1-IMMINENT FAILURE
0-FAILURE

KS

SIGNED ______________________ INSPECTOR

REVIEWED ______________________ SUPERVISOR

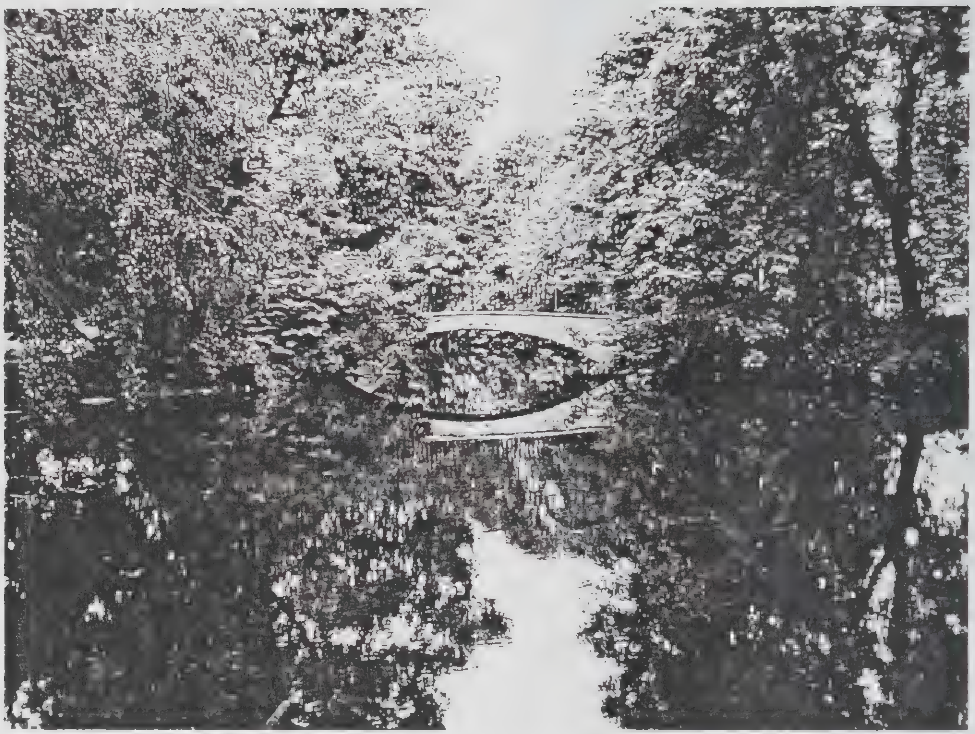


Figure 24: Downstream Elevation

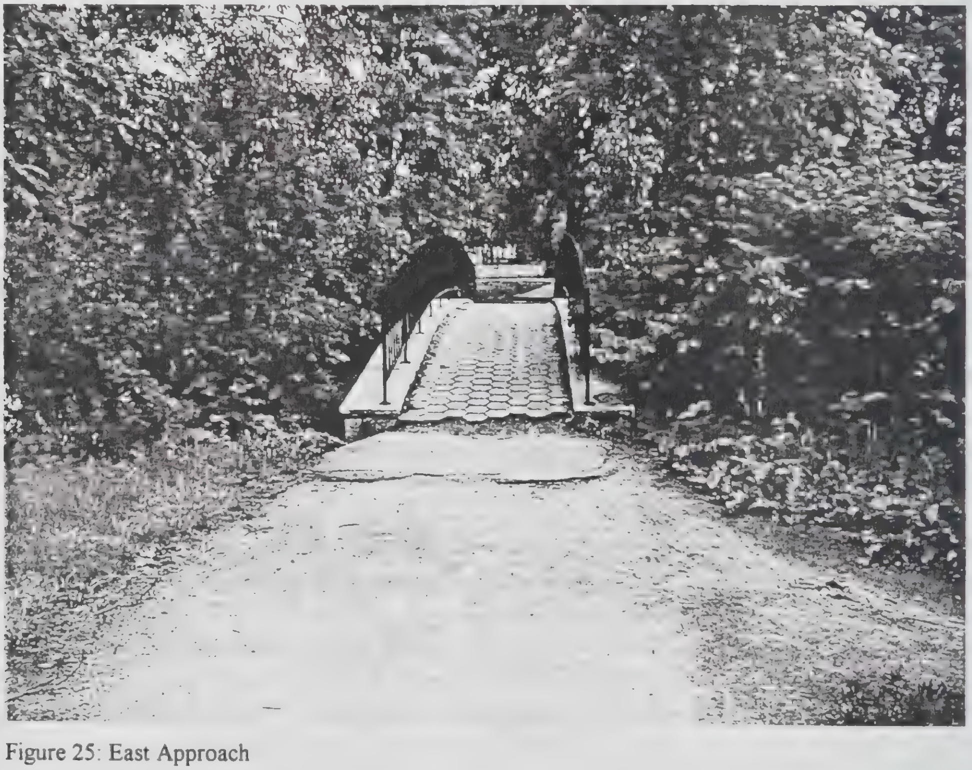


Figure 25: East Approach

MUDDY RIVER-BRIDGE INVENTORY

SPECTOR(S): BRANT BALLANTYNE INSPECTION DATE: 6/9/00

AL INFORMATION

TY/TOWN: BOSTON

IDGE NAME: AVENUE LOUIS PASTEUR

IDGE NUMBER: B-16-190

IDGE OWNER: CITY OF BOSTON

IDGE TYPE: BRICK ARCH W/ FAÇADE

IDGE USAGE: VEHICLE

TE OF CONSTRUCTION: 1892

TE(S) OF REHABILITATION:

ER: AVENUE LOUIS PASTEUR

DER: MUDDY RIVER

GEOMETRY

TAL LENGTH: 15 (FT) (IN)

MBER OF SPANS: 1 @ 15 (FT) 0 (IN)

MBER OF PIERS:

IDGE WIDTH: (OUT-TO-OUT) VARIES (FT) (IN)

MBER OF TRAVEL LANES: 1

MBER OF SIDEWALKS: 3 @ 6 (FT) 0 (IN)

EDIAN: (~~YES~~/NO) (FT) (IN)

PE OF RAILING: STONE MASONRY

PE OF FENCING:

TURAL CONDITION

GENERAL	CONDITION
PROACH	8
CK/TOPPING	8
OSION	6
OUR	
ILING	6
INT	

ABUTMENTS	CONDITION (1)	CONDITION (2)
STEM		
WINGWALLS	7	7
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING		
FOOTING		
SETTLEMENT	6	6

PIERS	CONDITION
PILES	
FOOTINGS	
PIER PROTECTION	
STEM OR COLUMNS	
CAP BEAMS	
PEDESTALS	
DIAGONAL BRACING	
SETTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	
BOTTOM FLANGE	
WEB	
STIFFENERS	
RIVETS/BOLTS	
WELDS	
GUSSETS	
DIAPHRAGMS	

ARCH BRIDGES	CONDITION
KEYSTONE AREA	7
ARCH RING	7
SPRINGLINE	7
SPANDREL WALLS	6
FAÇADE	6
FOOTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	7

RATING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY
5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL
1-IMMINENT FAILURE
0-FAILURE

REMARKS

Façade ringstone appears to have 'slipped'
Wing and spandrel walls are drystacked large stones
Large amounts of vegetation through walls
Arch is one-sided - underground culvert to the south

SIGNED ____________________ INSPECTOR

REVIEWED ____________________ SUPERVISOR

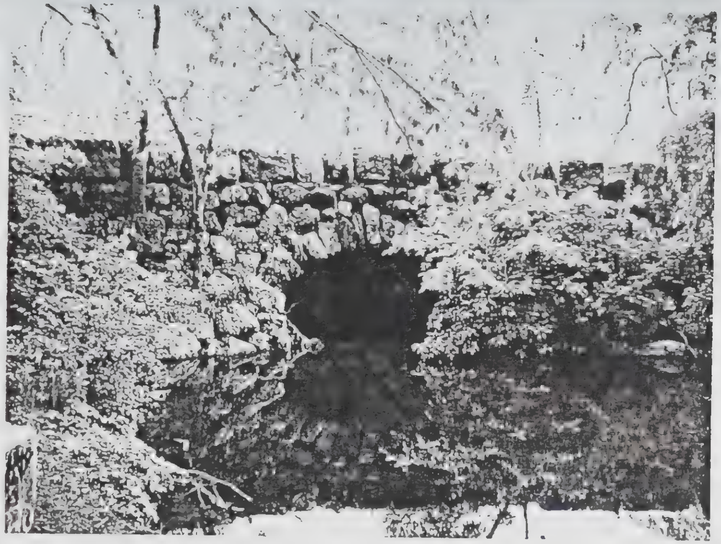


Figure 26: Downstream Elevation

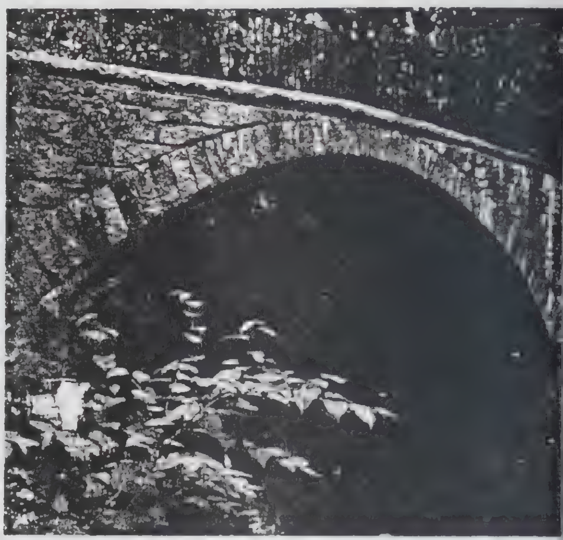
Figure 27: West Approach

Figure 28: East Approach

MUDDY RIVER-BRIDGE INVENTORY

INSPECTOR(S): Brant Ballantyne INSPECTION DATE: 6/9/00

GENERAL INFORMATION



CITY/TOWN: Boston

BRIDGE NAME: Riverway Acces to MBTA

BRIDGE NUMBER:

BRIDGE OWNER: City of Boston

BRIDGE TYPE: Brick Arch W/ Façade

BRIDGE USAGE: Pedestrian

DATE OF CONSTRUCTION:

DATE(S) OF REHABILITATION:

OVER: Pedestrian Walkway

UNDER: Muddy River

BRIDGE GEOMETRY

TOTAL LENGTH: 46 (FT) 8 1/2 (IN)

NUMBER OF SPANS: 1 @ 46 (FT) 8 1/2 (IN)

NUMBER OF PIERS:

BRIDGE WIDTH: (OUT-TO-OUT) 13 (FT) 1 (IN)

NUMBER OF TRAVEL LANES:

NUMBER OF SIDEWALKS: 1 @ 10 (FT) 0 (IN)

MEDIAN: (~~YES~~/NO) (FT) (IN)

TYPE OF RAILING: Steel

TYPE OF FENCING:

STRUCTURAL CONDITION

GENERAL	CONDITION
APPROACH	7
DECK/TOPPING	7
EROSION	
SCOUR	
RAILING	8
PAINT	6

ABUTMENTS	CONDITION (I)	CONDITI
STEM		
WINGWALLS	7	7
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING	7	7
FOOTING		
SETTLEMENT	7	7

PIERS	CONDITION
ILES	
OOTINGS	
IER PROTECTION	
TEM OR COLUMNS	
AP BEAMS	
EDESTALS	
IAGONAL BRACING	
ETTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	
BOTTOM FLANGE	
WEB	
STIFFENERS	
RIVETS/BOLTS	
WELDS	
GUSSETS	
DIAPHRAGMS	

ARCH BRIDGES	CONDITION
EYSTONE AREA	8
RCH RING	8
PRINGLINE	6
PANDREL WALLS	8
AÇADE	8
OOTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	8

ATING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY
5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL
1-IMMINENT FAILURE
0-FAILURE

RKS

FFLUENCE AT BARREL FAÇADE

SIGNED ______________ INSPECTOR

REVIEWED ______________ SUPERVISOR

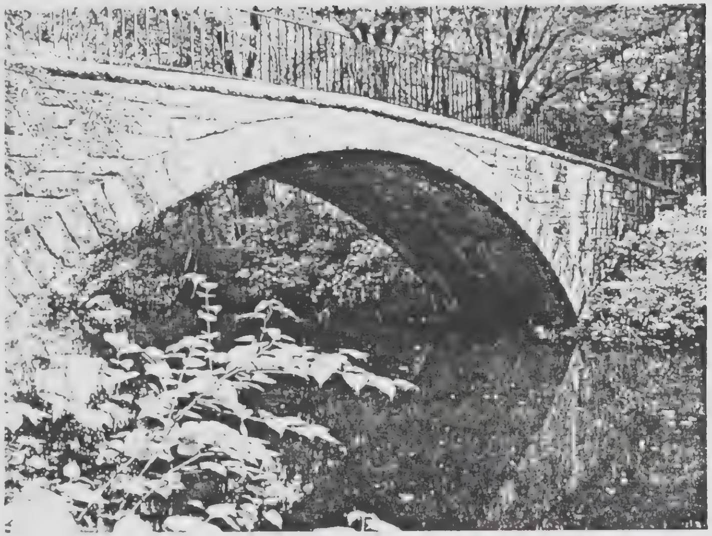


Figure 29: Downstream Elevation

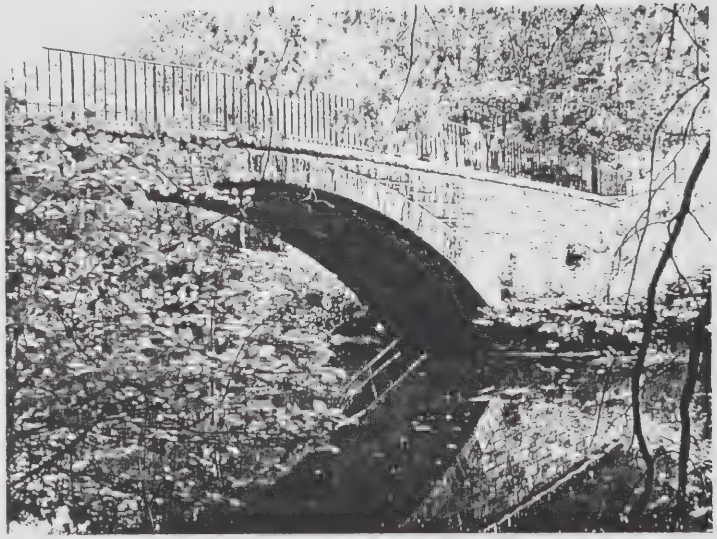
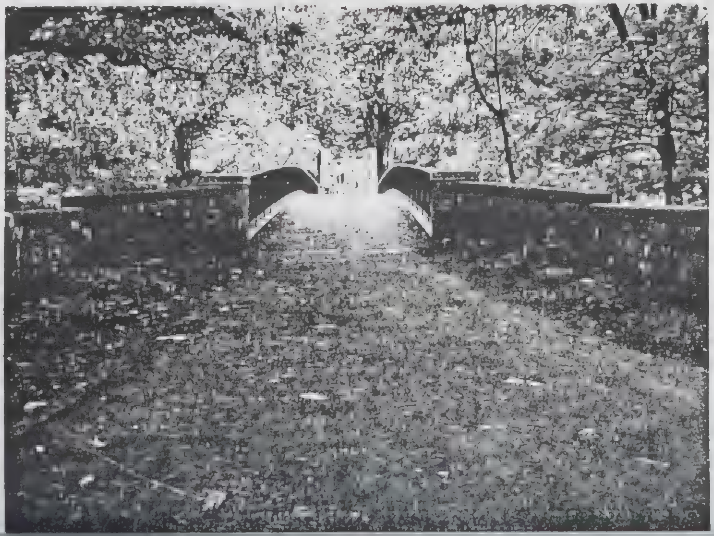
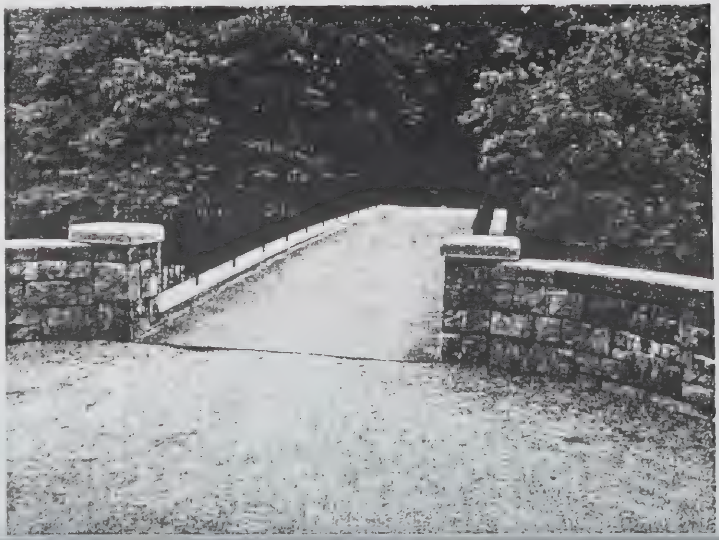


Figure 30: Upstream Elevation





MUDDY RIVER-BRIDGE INVENTORY

ISPECTOR(S): Brant Ballantyne INSPECTION DATE: 6/9/00

AL INFORMATION

TY/TOWN: Boston

RIDGE NAME: Longwood Ave

RIDGE NUMBER: B-16-192

RIDGE OWNER: MHD

RIDGE TYPE: Brick Arch w/ Façade

RIDGE USAGE: Vehicle

ATE OF CONSTRUCTION: 1897

ATE(S) OF REHABILITATION:

VER: Longwood Avenue

IDER: Muddy River

GEOMETRY

TAL LENGTH: 100 (FT) 0 (IN)

IMBER OF SPANS: 1 @ 100 (FT) 0 (IN)

IMBER OF PIERS:

IDGE WIDTH: (OUT-TO-OUT) 46 (FT) 0 (IN)

IMBER OF TRAVEL LANES: 2

IMBER OF SIDEWALKS: 2 @ 7 (FT) 0 (IN)

EDIAN: (~~YES~~/NO) (FT) (IN)

PE OF RAILING: Stone Masonry

PE OF FENCING:

TURAL CONDITION

GENERAL	CONDITION
PROACH	5
CK/TOPPING	5
OSION	7
OUR	
ILING	7
INT	

ABUTMENTS	CONDITION (1)	CONDITION (2)
STEM		
WINGWALLS	7	7
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING	8	8
FOOTING		
SETTLEMENT		

PIERS	CONDITION
PILES	
FOOTINGS	
PIER PROTECTION	
STEM OR COLUMNS	
CAP BEAMS	
PEDESTALS	
DIAGONAL BRACING	
SETTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	
BOTTOM FLANGE	
WEB	
STIFFENERS	
RIVETS/BOLTS	
WELDS	
GUSSETS	
DIAPHRAGMS	

ARCH BRIDGES	CONDITION
KEYSTONE AREA	8
ARCH RING	8
SPRINGLINE	8
SPANDREL WALLS	7
FAÇADE	7
FOOTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	8

RATING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY
5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL
1-IMMINENT FAILURE
0-FAILURE

REMARKS

SIGNED ____________________ INSPECTOR

REVIEWED ____________________ SUPERVISOR

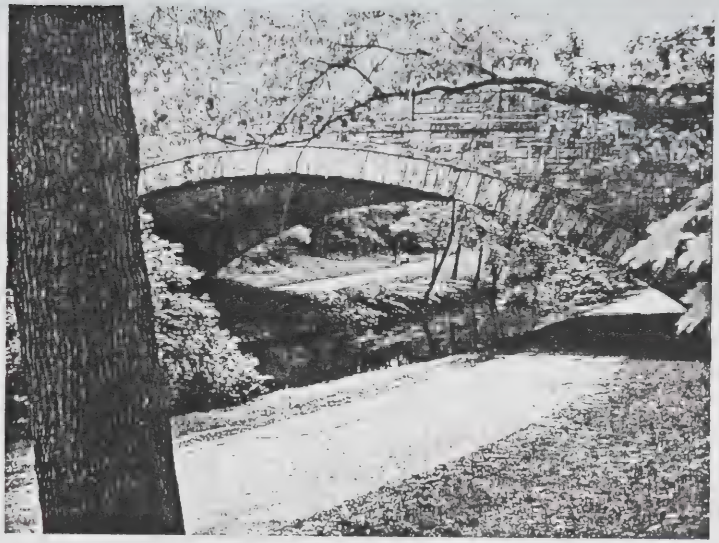


Figure 33: Downstream Elevation

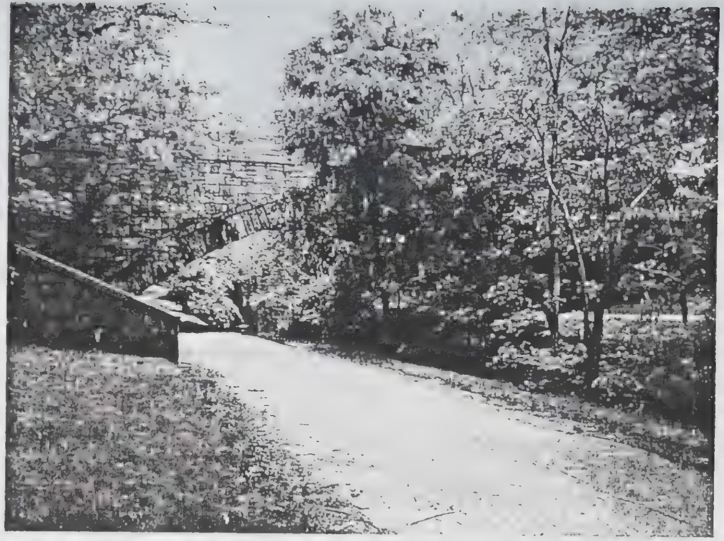


Figure 34: Upstream Elevation

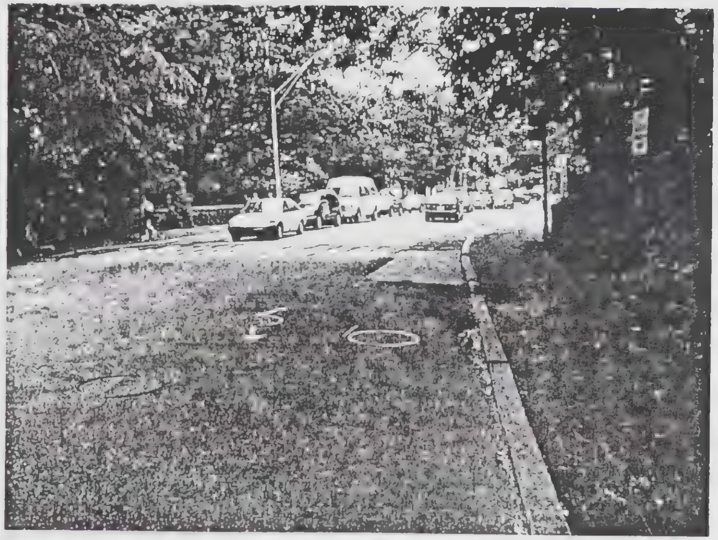


Figure 35: West Approach

MUDDY RIVER-BRIDGE INVENTORY

INSPECTOR(S): Brant Ballantyne INSPECTION DATE: 6/9/00

GENERAL INFORMATION

CITY/TOWN: Boston

BRIDGE NAME: Netherlands Road

BRIDGE NUMBER: B-16-193 = B-27-013

BRIDGE OWNER: Boston Parks & Rec. Dept.

BRIDGE TYPE: Brick Arch w/ Façade

BRIDGE USAGE: Vehicle

DATE OF CONSTRUCTION: 1891

DATE(S) OF REHABILITATION:

OVER: Netherlands Road

UNDER: Muddy River

BRIDGE GEOMETRY

TOTAL LENGTH: 44 (FT) 0 (IN)

NUMBER OF SPANS: 1 @ 44 (FT) 0 (IN)

NUMBER OF PIERS:

BRIDGE WIDTH: (OUT-TO-OUT) 41 (FT) 0 (IN)

NUMBER OF TRAVEL LANES: 2

NUMBER OF SIDEWALKS: 1 @ 6 (FT) 0 (IN)

MEDIAN: (~~YES~~/NO) (FT) (IN)

TYPE OF RAILING: Stone Masonry

TYPE OF FENCING:

STRUCTURAL CONDITION

GENERAL	CONDITION
APPROACH	6
DECK/TOPPING	6
EROSION	
SCOUR	
RAILING	6
PAINT	

ABUTMENTS	CONDITION (1)	CONDITI
STEM		
WINGWALLS	6	6
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING	6	6
FOOTING		
SETTLEMENT		

PIERS	CONDITION
LES	
OOTINGS	
ER PROTECTION	
TEM OR COLUMNS	
AP BEAMS	
EDESTALS	
AGONAL BRACING	
ETTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	
BOTTOM FLANGE	
WEB	
STIFFENERS	
RIVETS/BOLTS	
WELDS	
GUSSETS	
DIAPHRAGMS	

ARCH BRIDGES	CONDITION
EYSTONE AREA	7
RCH RING	7
RINGLINE	6
ANDREL WALLS	7
ÇADE	7
OTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	7

TING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY
5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL
1-IMMINENT FAILURE
0-FAILURE

KS

RTAR LOSS AT WATER LEVEL

SIGNED ______________ INSPECTOR

REVIEWED Will Vance SUPERVISOR

NETHERLANDS ROAD

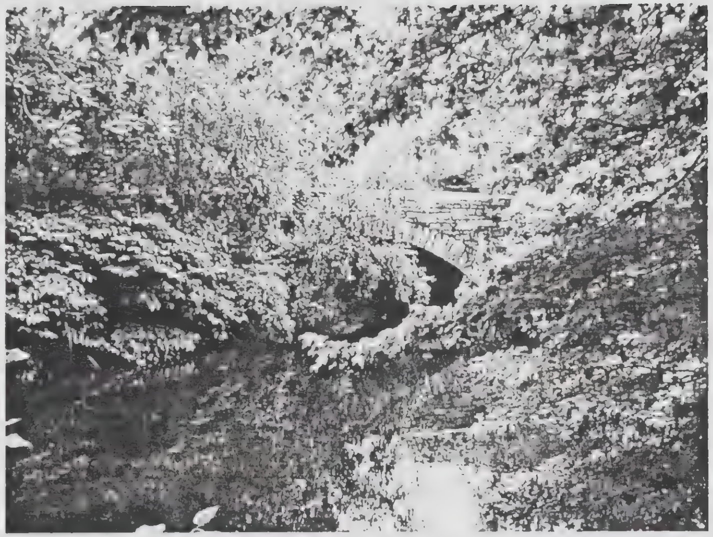


Figure 36: Downstream Elevation

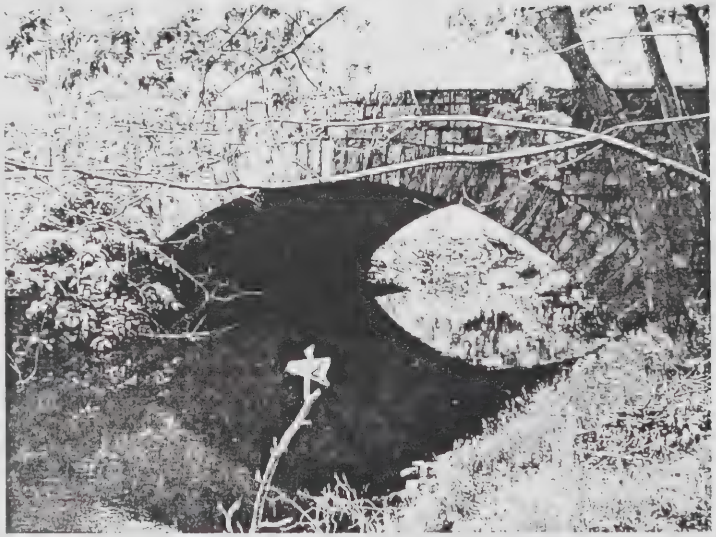
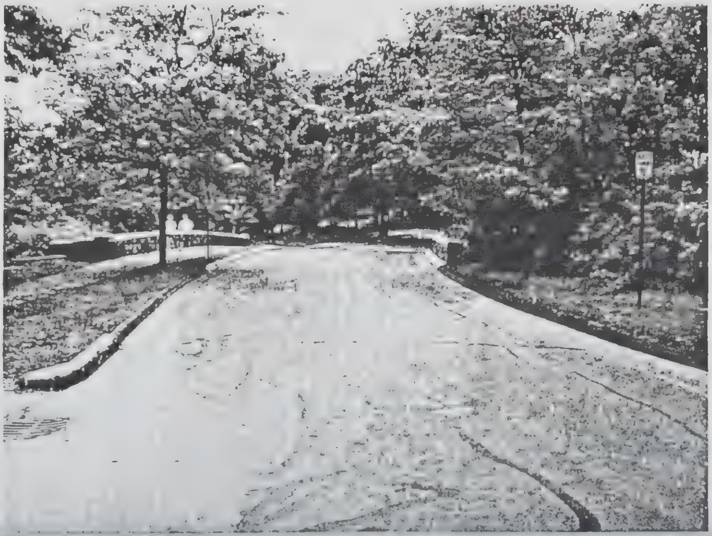
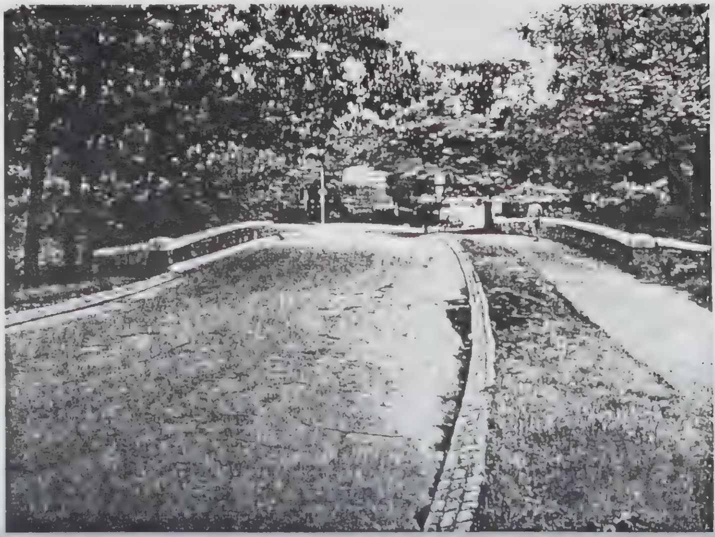


Figure 37: Upstream Elevation

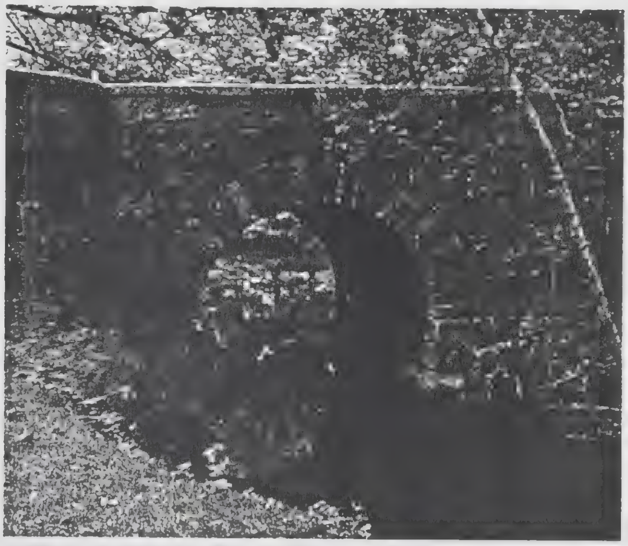




MUDDY RIVER-BRIDGE INVENTORY

NSPECTOR(S): Brant Ballantyne INSPECTION DATE: 6/9/00

RAL INFORMATION



TY/TOWN: Boston

RIDGE NAME: Island Bridge #1

RIDGE NUMBER:

RIDGE OWNER: town of Brookline

RIDGE TYPE: Brick Arch W/ Façade

RIDGE USAGE: Pedestrian

ATE OF CONSTRUCTION: 1891

ATE(S) OF REHABILITATION:

VER: Pedestrian Walkway

NDER: Muddy River

E GEOMETRY

TAL LENGTH: 10 (FT) 0 (IN)

MBER OF SPANS: 1 @ 10 (FT) (IN)

MBER OF PIERS:

IDGE WIDTH: (OUT-TO-OUT) 20 (FT) 0 (IN)

MBER OF TRAVEL LANES:

MBER OF SIDEWALKS: 1 @ 16 (FT) 0 (IN)

EDIAN: (~~YES~~/NO) (FT) (IN)

PE OF RAILING: Stone masonry

PE OF FENCING:

TURAL CONDITION

GENERAL	CONDITION
PROACH	7
CK/TOPPING	8
OSION	5
OUR	
ILING	7
INT	

ABUTMENTS	CONDITION (1)	CONDITION (2)
STEM		
WINGWALLS	7	7
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING	7	7
FOOTING		
SETTLEMENT	7	7

PIERS	CONDITION
PILES	
FOOTINGS	
PIER PROTECTION	
STEM OR COLUMNS	
CAP BEAMS	
PEDESTALS	
DIAGONAL BRACING	
SETTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	
BOTTOM FLANGE	
WEB	
STIFFENERS	
RIVETS/BOLTS	
WELDS	
GUSSETS	
DIAPHRAGMS	

ARCH BRIDGES	CONDITION
KEYSTONE AREA	7
ARCH RING	7
SPRINGLINE	7
SPANDREL WALLS	7
FAÇADE	7
FOOTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	7

RATING VALUES

- 9-EXCELLENT
- 8-VERY GOOD
- 7-GOOD
- 6-SATISFACTORY
- 5-FAIR
- 4-POOR
- 3-SERIOUS
- 2-CRITICAL
- 1-IMMINENT FAILURE
- 0-FAILURE

REMARKS

MORTAR DETERIORATION AT WATER LEVEL OF ARCH AND WINGWALLS

SIGNED ______ INSPECTOR

REVIEWED ______ SUPERVISOR

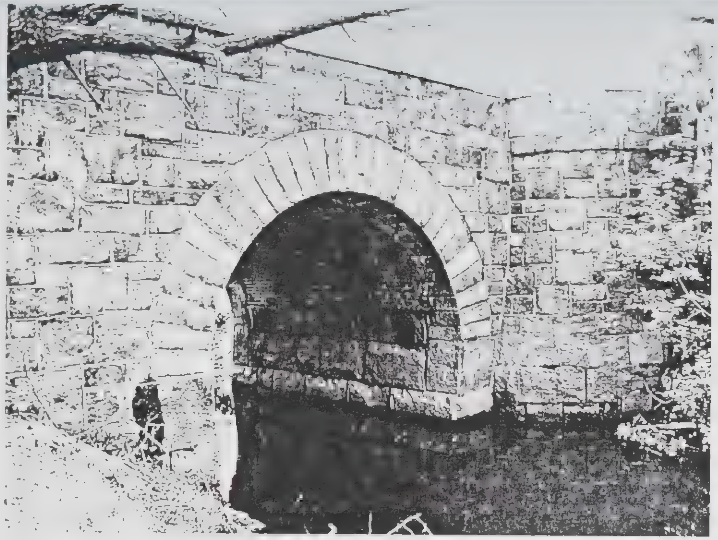


Figure 40: Downstream Elevation

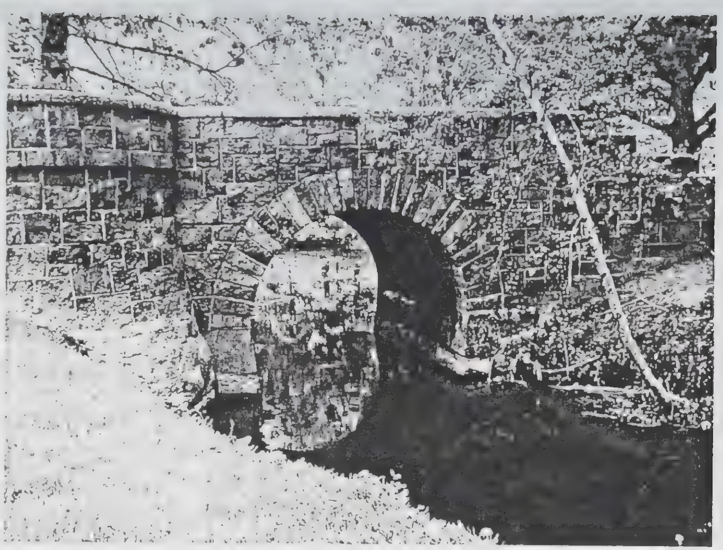


Figure 41: Upstream Elevation

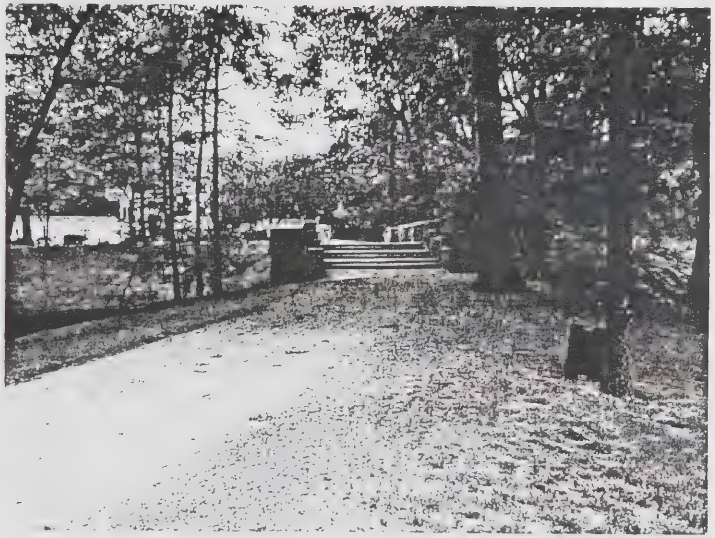


Figure 42: West Approach

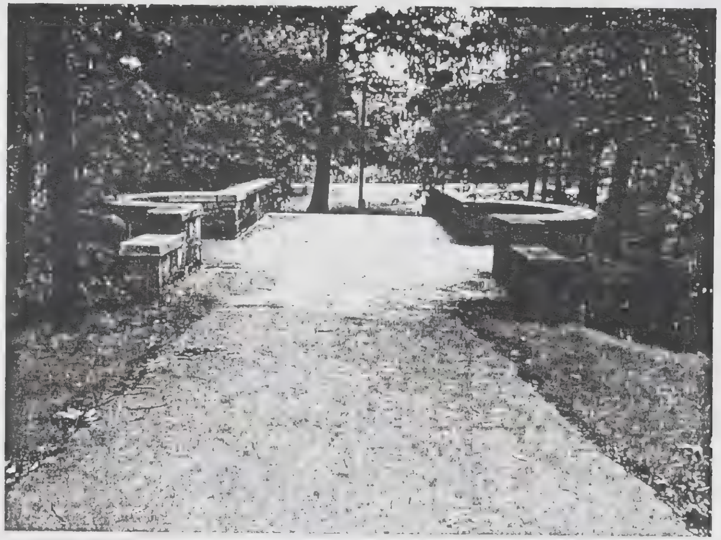


Figure 43: East Approach

MUDDY RIVER-BRIDGE INVENTORY

INSPECTOR(S): Brant Ballantyne INSPECTION DATE: 6/9/00

GENERAL INFORMATION

CITY/TOWN: Boston

BRIDGE NAME: Island Bridge #2

BRIDGE NUMBER:

BRIDGE OWNER: Boston Parks & Rec. Dept.

BRIDGE TYPE: Brick Arch W/ Façade

BRIDGE USAGE: Pedestrian

DATE OF CONSTRUCTION: 1891

DATE(S) OF REHABILITATION:

OVER: Pedestrian Walkway

UNDER: Muddy River

BRIDGE GEOMETRY

TOTAL LENGTH: 10 (FT) 0 (IN)

NUMBER OF SPANS: 1 @ 10 (FT) (IN)

NUMBER OF PIERS:

BRIDGE WIDTH: (OUT-TO-OUT) 18 (FT) 0 (IN)

NUMBER OF TRAVEL LANES:

NUMBER OF SIDEWALKS: 1 @ 14 (FT) 0 (IN)

MEDIAN: (~~YES~~/NO) (FT) (IN)

TYPE OF RAILING: Stone masonry

TYPE OF FENCING:

STRUCTURAL CONDITION

GENERAL	CONDITION
APPROACH	6
DECK/TOPPING	7
EROSION	5
SCOUR	
RAILING	7
PAINT	

ABUTMENTS	CONDITION (1)	CONDITI
STEM		
WINGWALLS	7	7
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING	8	8
FOOTING		
SETTLEMENT		

PIERS	CONDITION
LES	
OOTINGS	
ER PROTECTION	
TEM OR COLUMNS	
AP BEAMS	
EDESTALS	
AGONAL BRACING	
ETTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	
BOTTOM FLANGE	
WEB	
STIFFENERS	
RIVETS/BOLTS	
WELDS	
GUSSETS	
DIAPHRAGMS	

ARCH BRIDGES	CONDITION
EYSTONE AREA	7
RCH RING	7
PRINGLINE	7
PANDREL WALLS	7
AÇADE	8
OOTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	7

ATING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY
5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL
1-IMMINENT FAILURE
0-FAILURE

KS

ORTAR DETERIORATION AT WATER LEVEL OF ARCH AND WINGWALLS
EGETATION GROWING THROUGH NORTH FAÇADE

SIGNED ______________ INSPECTOR

REVIEWED ______________ SUPERVISOR

ISLAND BRIDGE #2

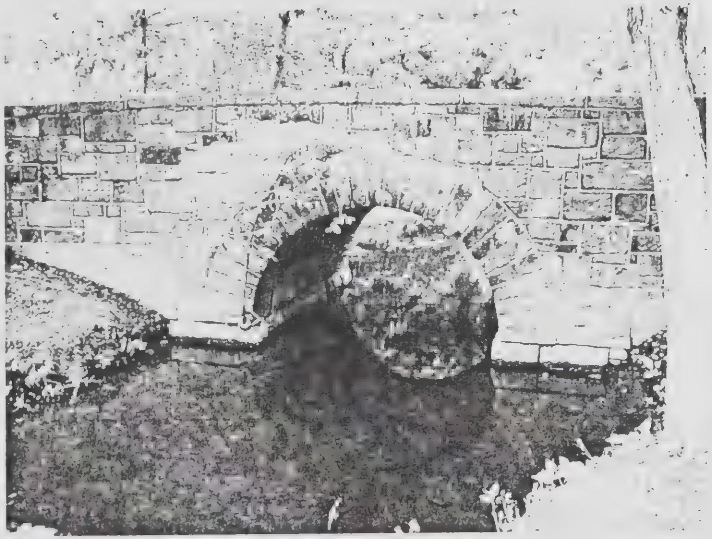


Figure 44· Downstream Elevation

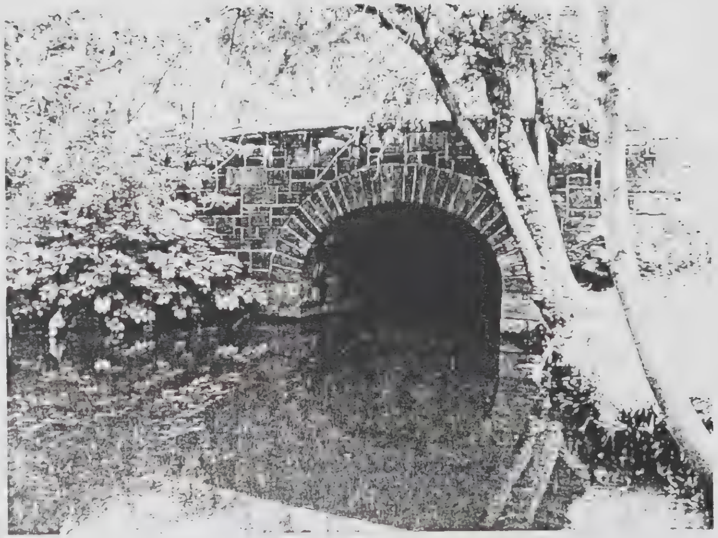
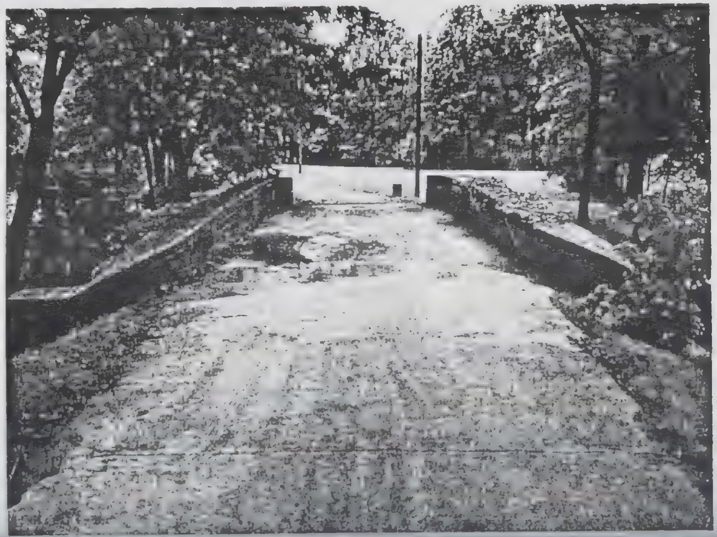
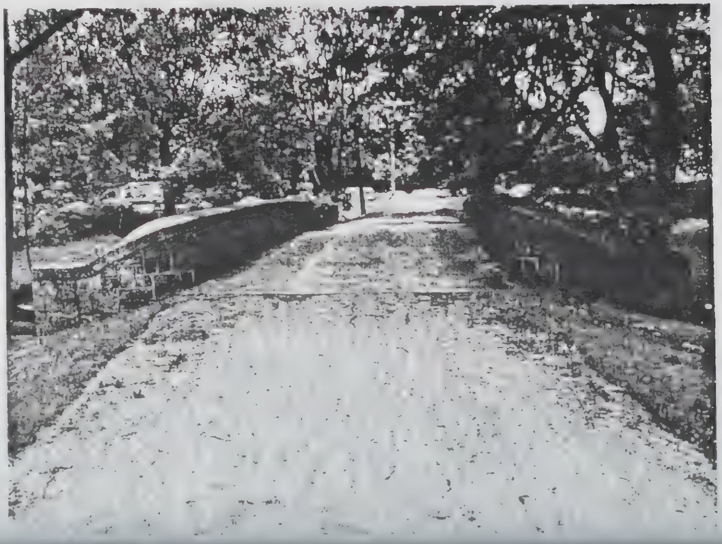


Figure 45· Upstream Elevation

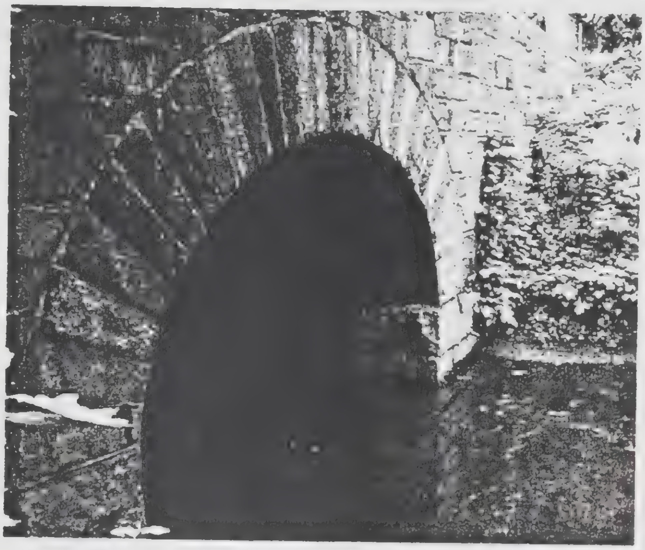




MUDDY RIVER-BRIDGE INVENTORY

SPECTOR(S): BRANT BALLANTYNE INSPECTION DATE: 6/9/00

AL INFORMATION



TY/TOWN: BOSTON

IDGE NAME: BROOKLINE AVE

IDGE NUMBER: B-16-194

IDGE OWNER: CITY OF BOSTON

IDGE TYPE: BRICK ARCH W/ FAÇADE

IDGE USAGE: VEHICLE

TE OF CONSTRUCTION: 1891

TE(S) OF REHABILITATION:

ER: NETHERLANDS ROAD

DER: MUDDY RIVER

GEOMETRY

TAL LENGTH: 15 (FT) 0 (IN)

MBER OF SPANS: 1 @ 15 (FT) 0 (IN)

MBER OF PIERS:

DGE WIDTH: (OUT-TO-OUT) 95 (FT) 0 (IN)

MBER OF TRAVEL LANES: 5

MBER OF SIDEWALKS: 2 @ 10 (FT) 0 (IN)

DIAN: (~~YES~~/NO) (FT) (IN)

PE OF RAILING: STONE MASONRY

PE OF FENCING:

URAL CONDITION

GENERAL	CONDITION
PROACH	7
CK/TOPPING	7
OSION	7
OUR	
LING	7
NT	

ABUTMENTS	CONDITION (1)	CONDITION (2)
STEM		
WINGWALLS	7	7
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING	8	8
FOOTING		
SETTLEMENT		

PIERS	CONDITION
PILES	
FOOTINGS	
PIER PROTECTION	
STEM OR COLUMNS	
CAP BEAMS	
PEDESTALS	
DIAGONAL BRACING	
SETTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	
BOTTOM FLANGE	
WEB	
STIFFENERS	
RIVETS/BOLTS	
WELDS	
GUSSETS	
DIAPHRAGMS	

ARCH BRIDGES	CONDITION
KEYSTONE AREA	7
ARCH RING	7
SPRINGLINE	7
SPANDREL WALLS	8
FAÇADE	8
FOOTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	7

RATING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY
5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL
1-IMMINENT FAILURE
0-FAILURE

REMARKS

MORTAR LOSS AT WATER LEVEL

SIGNED ______________ INSPECTOR

REVIEWED ______________ SUPERVISOR

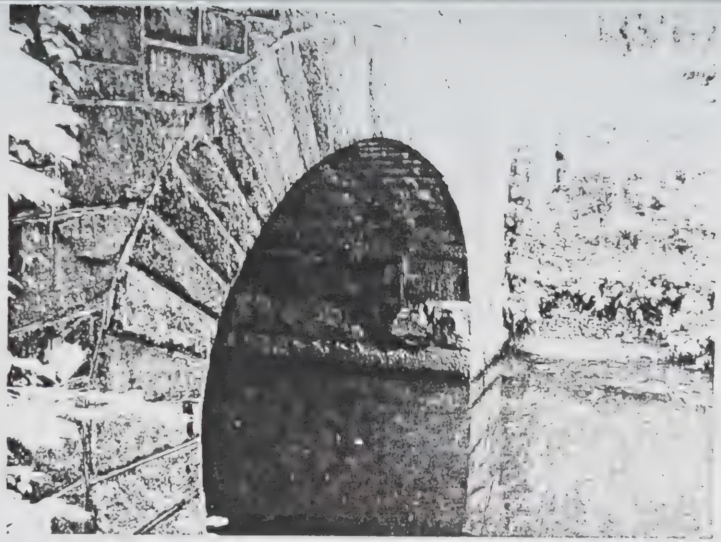


Figure 48: Upstream Elevation

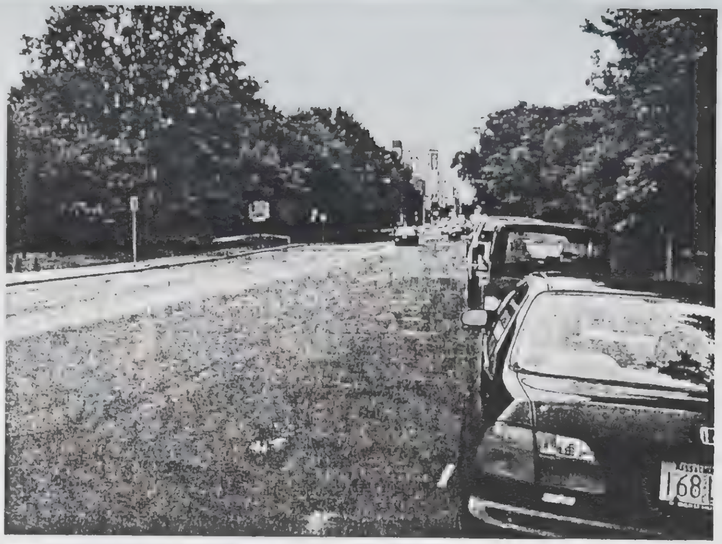


Figure 49: West Approach

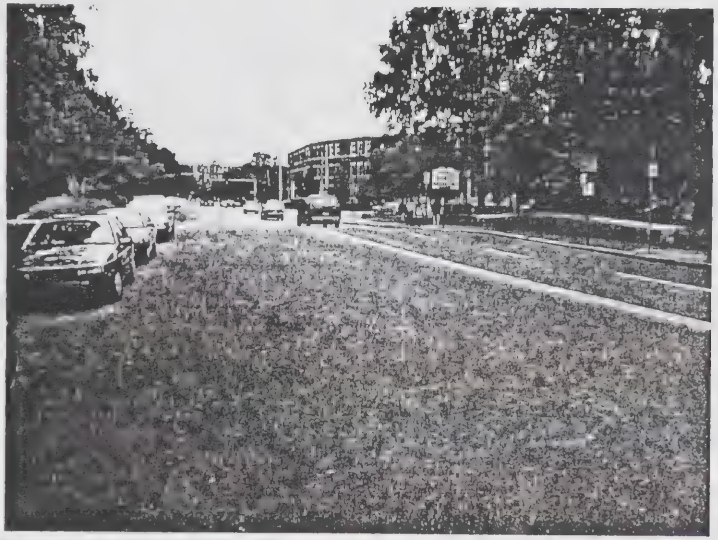


Figure 50: East Approach

MUDDY RIVER-BRIDGE INVENTORY

INSPECTOR(S): Brant Ballantyne
INSPECTION DATE: 6/9/00

GENERAL INFORMATION

CITY/TOWN: Boston

BRIDGE NAME: Jamaicaway Exit

BRIDGE NUMBER: B-27-012

BRIDGE OWNER: MHD

BRIDGE TYPE: C-I-P Conc. Arch w/ Façade

BRIDGE USAGE: Vehicle

DATE OF CONSTRUCTION: 1935

DATE(S) OF REHABILITATION:

OVER: US-1 Jamaicaway Exit/Entrance Ramp

UNDER: Muddy River

BRIDGE GEOMETRY

TOTAL LENGTH: 15 (FT) 0 (IN)

NUMBER OF SPANS: 1 @ 15 (FT) 0 (IN)

NUMBER OF PIERS:

BRIDGE WIDTH: (OUT-TO-OUT) 150 (FT) 0 (IN)

NUMBER OF TRAVEL LANES: 2

NUMBER OF SIDEWALKS: 1 @ 10 (FT) 0 (IN)

MEDIAN: (YES/~~NO~~) VARIES (FT) (IN)

TYPE OF RAILING: Stone Masonry

TYPE OF FENCING:

STRUCTURAL CONDITION

GENERAL	CONDITION
APPROACH	7
DECK/TOPPING	7
EROSION	
SCOUR	
RAILING	5
PAINT	

ABUTMENTS	CONDITION (1)	CONDITI
STEM		
WINGWALLS	7	7
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING	6	6
FOOTING		
SETTLEMENT		

PIERS	CONDITION
ES	
OTINGS	
ER PROTECTION	
EM OR COLUMNS	
P BEAMS	
DESTALS	
AGONAL BRACING	
TTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	
BOTTOM FLANGE	
WEB	
STIFFENERS	
RIVETS/BOLTS	
WELDS	
GUSSETS	
DIAPHRAGMS	

ARCH BRIDGES	CONDITION
YSTONE AREA	7
CH RING	6
RINGLINE	7
ANDREL WALLS	7
ÇADE	7
OTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	7

TING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY

5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL

1-IMMINENT FAILURE
0-FAILURE

S

ERIORATION OF C-I-P CONCRETE AT FAÇADE

TH SIDE VEHICLE RAILING IS STONE TURRET POSTS W/ METAL ANGLE RAILS

SIGNED ______________ INSPECTOR

REVIEWED ______________ SUPERVISOR

JAMAICAWAY EXIT

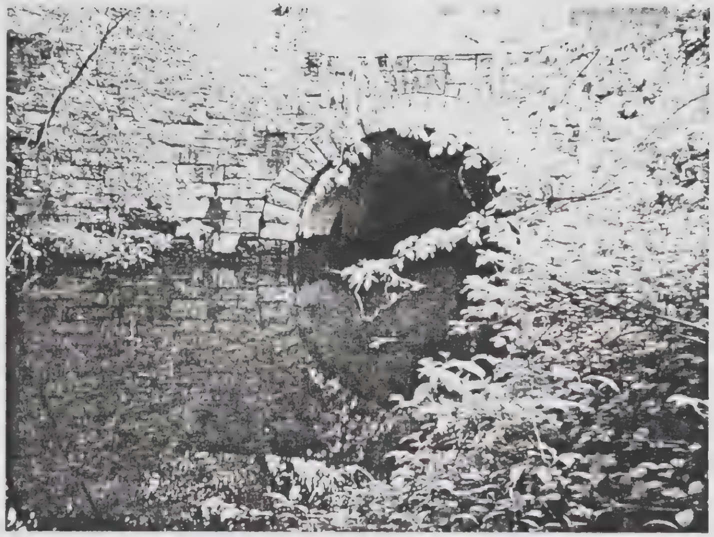


Figure 51: Downstream Elevation

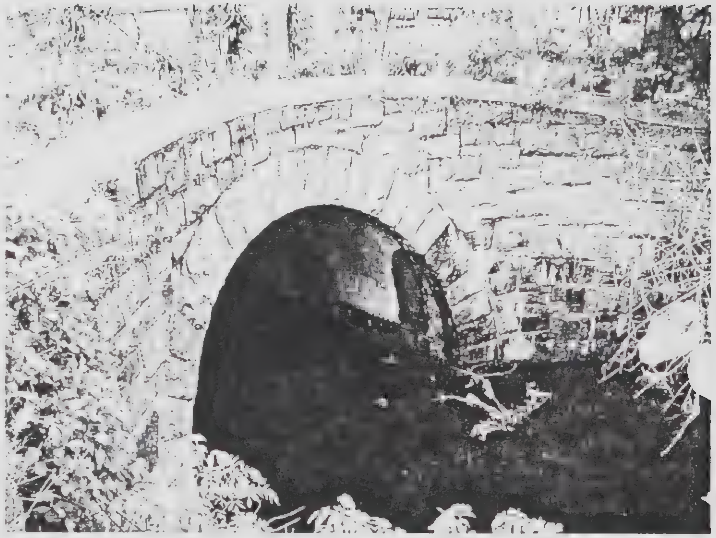


Figure 52: Upstream Elevation

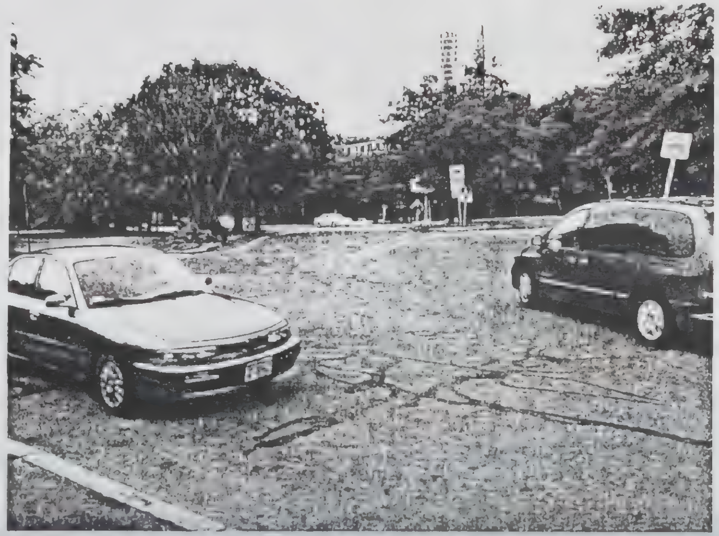
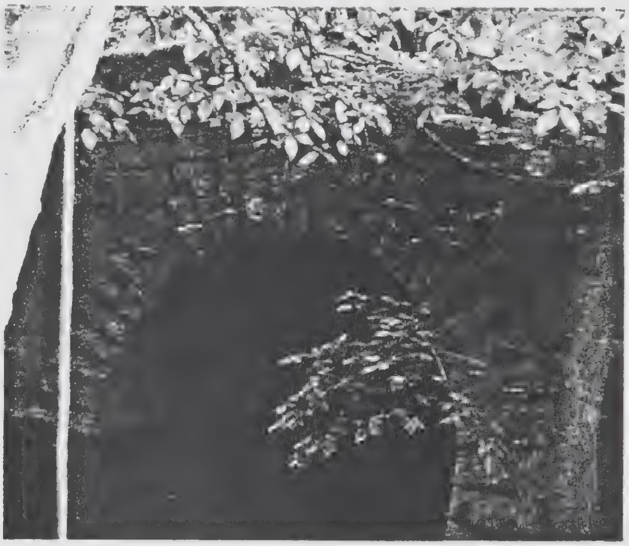


Figure 53: West Approach

MUDDY RIVER-BRIDGE INVENTORY

SPECTOR(S): Brant Ballantyne INSPECTION DATE: 6/9/00

AL INFORMATION



TY/TOWN: Boston

IDGE NAME: Route 9

IDGE NUMBER: B-16-008 = B-27-009

IDGE OWNER: MHD

IDGE TYPE: C-I-P Conc. Arch w/ Façade

IDGE USAGE: Vehicle

TE OF CONSTRUCTION: 1935

TE(S) OF REHABILITATION:

ER: Rte 9 / Huntington Ave

DER: Muddy River

GEOMETRY

TAL LENGTH: 15 (FT) 0 (IN)

MBER OF SPANS: 1 @ 15 (FT) 0 (IN)

MBER OF PIERS:

IDGE WIDTH: (OUT-TO-OUT) 250 (FT) 0 (IN)

MBER OF TRAVEL LANES: 8

MBER OF SIDEWALKS: 4 @ 8 (FT) 0 (IN)

DIAN: (YES/~~NO~~) 3 (FT) (IN)

PE OF RAILING: Stone Masonry

PE OF FENCING:

TURAL CONDITION

GENERAL	CONDITION
PROACH	6
CK/TOPPING	6
OSION	6
OUR	
ILING	7
INT	

ABUTMENTS	CONDITION (1)	CONDITION (2)
STEM		
WINGWALLS	7	7
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING	6	6
FOOTING		
SETTLEMENT		

PIERS	CONDITION
PILES	
FOOTINGS	
PIER PROTECTION	
STEM OR COLUMNS	
CAP BEAMS	
PEDESTALS	
DIAGONAL BRACING	
SETTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	
BOTTOM FLANGE	
WEB	
STIFFENERS	
RIVETS/BOLTS	
WELDS	
GUSSETS	
DIAPHRAGMS	

ARCH BRIDGES	CONDITION
KEYSTONE AREA	7
ARCH RING	7
SPRINGLINE	7
SPANDREL WALLS	7
FAÇADE	8
FOOTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	7

RATING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY
5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL
1-IMMINENT FAILURE
0-FAILURE

REMARKS

MORTAR/CONC. DETERIORATION AT WATER LEVEL
NORTH SIDE ARCH HAS HEAVY MORTAR DETERIORATION

SIGNED ______________________ INSPECTOR

REVIEWED ______________________ SUPERVISOR

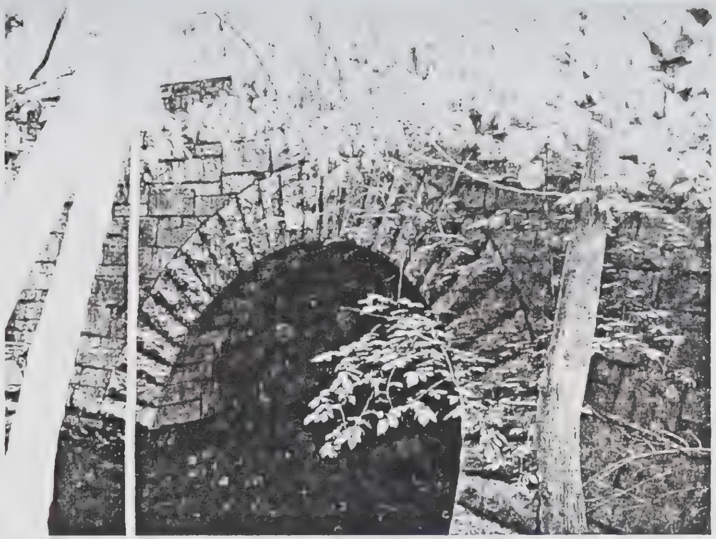


Figure 54: Downstream Elevation

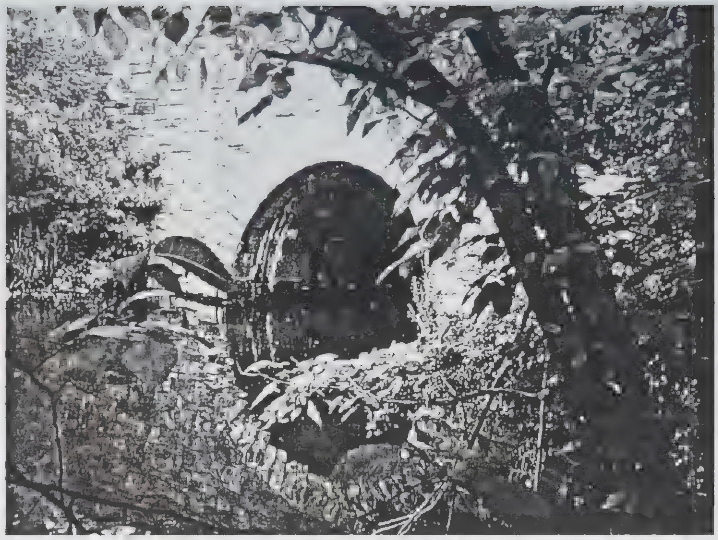


Figure 55: Upstream Elevation

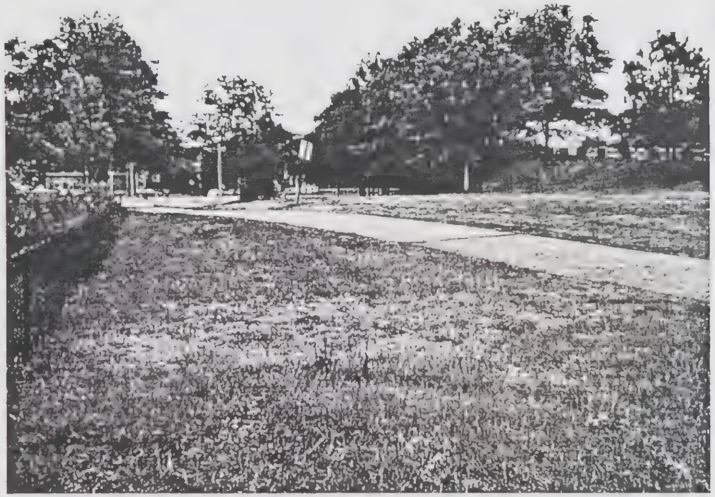


Figure 56: Looking Downstream across Bridge

MUDDY RIVER-BRIDGE INVENTORY

INSPECTOR(S): BRANT BALLANTYNE INSPECTION DATE: 6/9/00

GENERAL INFORMATION

CITY/TOWN: BOSTON

BRIDGE NAME: COVE BRIDGE

BRIDGE NUMBER:

BRIDGE OWNER: BOSTON PARKS & REC. DEPT.

BRIDGE TYPE: BRICK ARCH W/ FAÇADE

BRIDGE USAGE: PEDESTRIAN

DATE OF CONSTRUCTION: 1892

DATE(S) OF REHABILITATION:

OVER: PEDESTRIAN WALKWAY

UNDER: LEVERETT POND

BRIDGE GEOMETRY

TOTAL LENGTH: 24 (FT) 0 (IN)

NUMBER OF SPANS: 1 @ 24 (FT) (IN)

NUMBER OF PIERS:

BRIDGE WIDTH: (OUT-TO-OUT) 18 (FT) 4 (IN)

NUMBER OF TRAVEL LANES:

NUMBER OF SIDEWALKS: 1 @ 15 (FT) 0 (IN)

MEDIAN: (~~YES~~/NO) (FT) (IN)

TYPE OF RAILING: STONE MASONRY

TYPE OF FENCING:

STRUCTURAL CONDITION

GENERAL	CONDITION
APPROACH	7
DECK/TOPPING	6
EROSION	
SCOUR	
RAILING	7
PAINT	

ABUTMENTS	CONDITION (I)	CONDITI
STEM		
WINGWALLS	7	7
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING	8	8
FOOTING		
SETTLEMENT		

PIERS	CONDITION
ES	
OTINGS	
ER PROTECTION	
EM OR COLUMNS	
P BEAMS	
DESTALS	
AGONAL BRACING	
TTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	
BOTTOM FLANGE	
WEB	
STIFFENERS	
RIVETS/BOLTS	
WELDS	
GUSSETS	
DIAPHRAGMS	

ARCH BRIDGES	CONDITION
YSTONE AREA	7
CH RING	7
RINGLINE	7
ANDREL WALLS	7
ÇADE	7
OTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	7

TING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY

5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL

1-IMMINENT FAILURE
0-FAILURE

KS

RTAR DETERIORATION AT WATER LEVEL OF ARCH AND WINGWALLS
GETATION GROWING THROUGH NORTH FAÇADE

SIGNED ________________ INSPECTOR

REVIEWED Willi Vannell SUPERVISOR

COVE BRIDGE

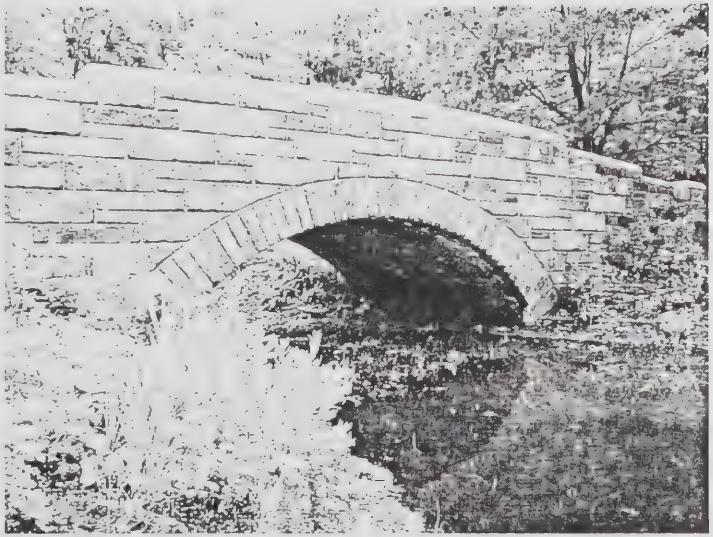


Figure 57: East Elevation

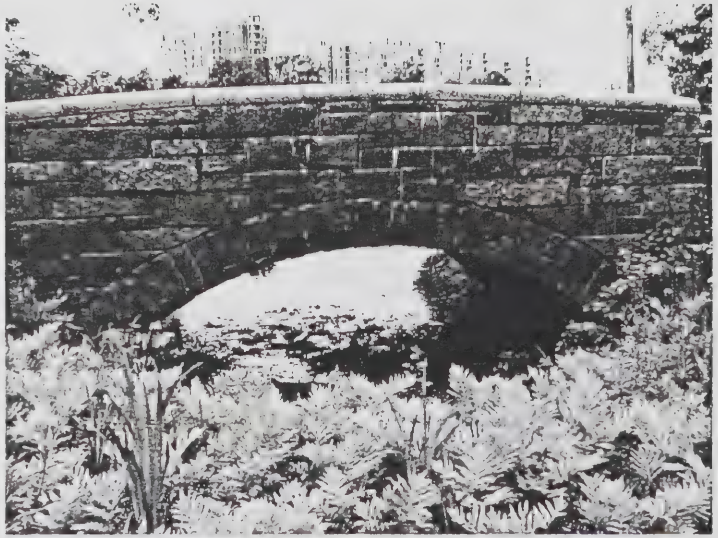
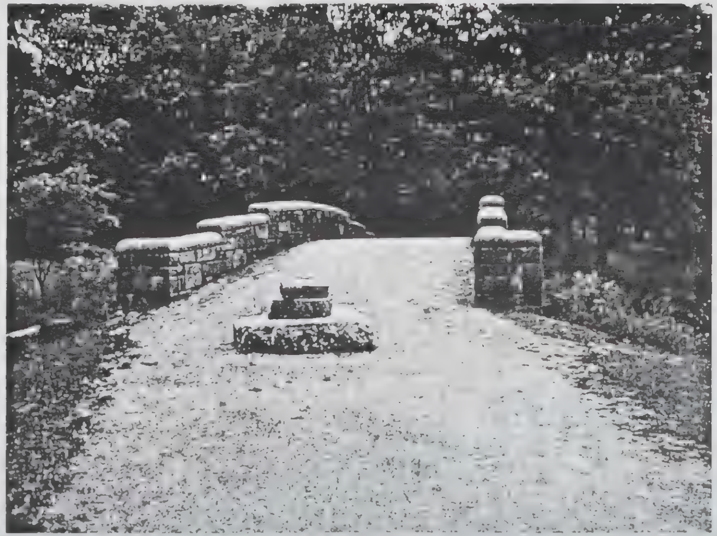


Figure 58: East Elevation



MUDDY RIVER-BRIDGE INVENTORY

SPECTOR(S): Brant Ballantyne INSPECTION DATE: 6/9/00

AL INFORMATION

TY/TOWN: Boston

IDGE NAME: Leverett Pond

IDGE NUMBER:

IDGE OWNER: Boston Parks & Rec. Dept.

IDGE TYPE: Brick Arch w/ Façade

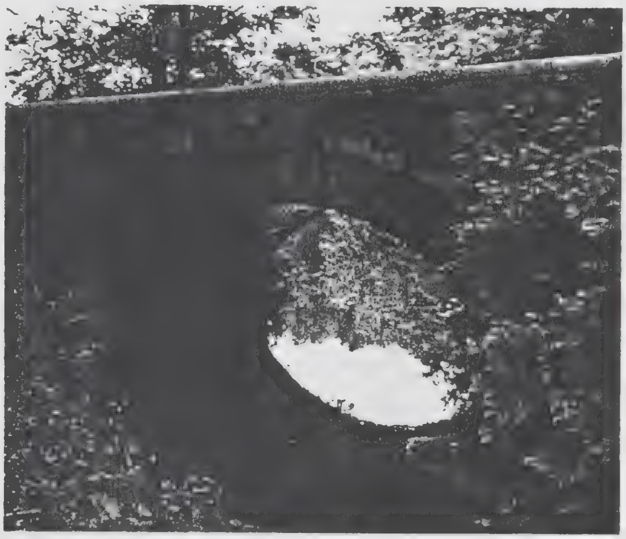
IDGE USAGE: Pedestrian

TE OF CONSTRUCTION: 1892

TE(S) OF REHABILITATION:

ER: Pedestrian Walkway

DER: Leverett Pond



GEOMETRY

TAL LENGTH: 20 (FT) 0 (IN)

MBER OF SPANS: 1 @ 20 (FT) (IN)

MBER OF PIERS:

IDGE WIDTH: (OUT-TO-OUT) varies (FT) (IN)

MBER OF TRAVEL LANES:

MBER OF SIDEWALKS: 1 @ 18 (FT) 0 (IN)

DIAN: (~~YES~~/NO) (FT) (IN)

PE OF RAILING: Stone masonry

PE OF FENCING:

TURAL CONDITION

GENERAL	CONDITION
PROACH	7
CK/TOPPING	6
OSION	
OUR	
ILING	7
INT	

ABUTMENTS	CONDITION (1)	CONDITION (2)
STEM		
WINGWALLS	8	8
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING	8	8
FOOTING		
SETTLEMENT		

PIERS	CONDITION
PILES	
FOOTINGS	
PIER PROTECTION	
STEM OR COLUMNS	
CAP BEAMS	
PEDESTALS	
DIAGONAL BRACING	
SETTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	
BOTTOM FLANGE	
WEB	
STIFFENERS	
RIVETS/BOLTS	
WELDS	
GUSSETS	
DIAPHRAGMS	

ARCH BRIDGES	CONDITION
KEYSTONE AREA	7
ARCH RING	7
SPRINGLINE	7
SPANDREL WALLS	8
FAÇADE	8
FOOTING	7

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	7

RATING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY
5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL
1-IMMINENT FAILURE
0-FAILURE

REMARKS

SIGNED ______________ INSPECTOR

REVIEWED ______________ SUPERVISOR

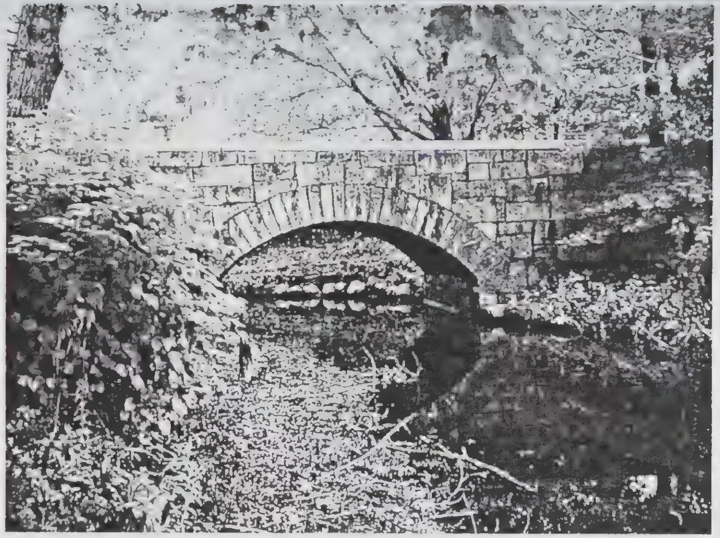


Figure 61. Downstream Elevation

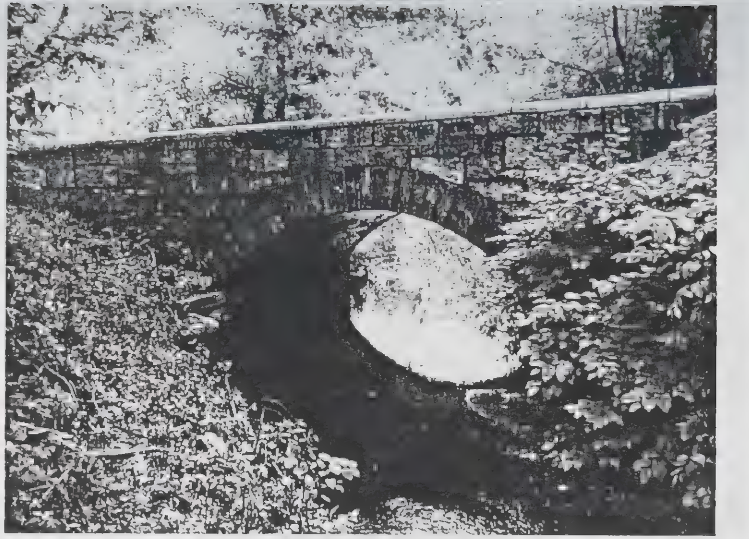


Figure 62: Upstream Elevation

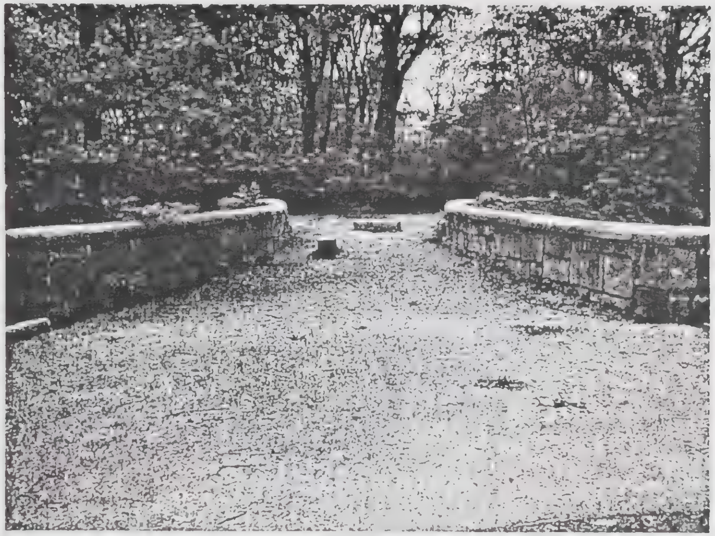


Figure 63: West Approach

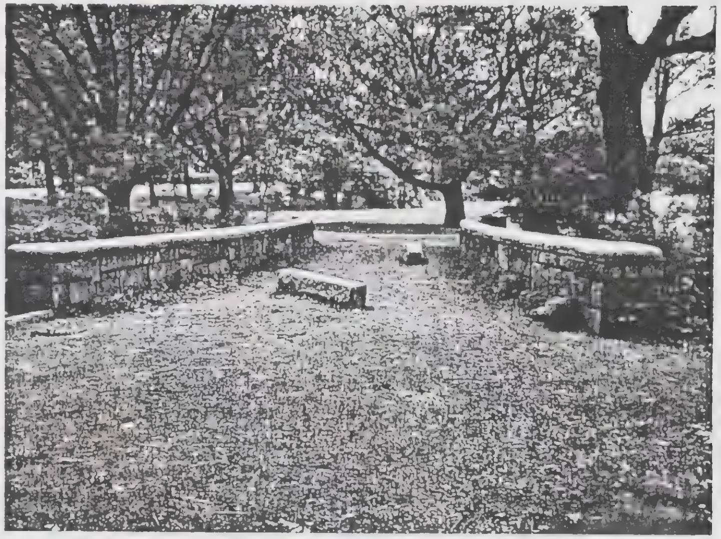


Figure 64: East Approach

MUDDY RIVER-BRIDGE INVENTORY

INSPECTOR(S): Brant Ballantyne INSPECTION DATE: 6/9/00

GENERAL INFORMATION

CITY/TOWN: Boston

BRIDGE NAME: Willow pond Road

BRIDGE NUMBER:

BRIDGE OWNER: Boston Parks & Rec. Dept.

BRIDGE TYPE: Round Brick Culvert

BRIDGE USAGE: Vehicle

DATE OF CONSTRUCTION: 1892

DATE(S) OF REHABILITATION:

OVER: Willow Pond Road

UNDER: Muddy River

BRIDGE GEOMETRY

TOTAL LENGTH: 4 (FT) 0 (IN)

NUMBER OF SPANS: 1 @ 4 (FT) 0 (IN)

NUMBER OF PIERS:

BRIDGE WIDTH: (OUT-TO-OUT) 120 (FT) 0 (IN)

NUMBER OF TRAVEL LANES: 1

NUMBER OF SIDEWALKS: 1 @ 7 (FT) 0 (IN)

MEDIAN: (~~YES~~/NO) (FT) (IN)

TYPE OF RAILING: Stone Masonry

TYPE OF FENCING:

STRUCTURAL CONDITION

GENERAL	CONDITION
APPROACH	7
DECK/TOPPING	7
EROSION	
SCOUR	
RAILING	6
PAINT	

ABUTMENTS	CONDITION (I)	CONDITIC
STEM		
WINGWALLS		
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING		
FOOTING		
SETTLEMENT		

PIERS	CONDITION
.ES	
OTINGS	
ER PROTECTION	
EM OR COLUMNS	
P BEAMS	
DESTALS	
AGONAL BRACING	
TTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	
BOTTOM FLANGE	
WEB	
STIFFENERS	
RIVETS/BOLTS	
WELDS	
GUSSETS	
DIAPHRAGMS	

ARCH BRIDGES	CONDITION
YSTONE AREA	
CH RING	
RINGLINE	
ANDREL WALLS	
CADE	
OTING	

CULVERTS	CONDITION
BARREL	6
HEADWALL	7
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	6

TING VALUES

9-EXCELLENT	5-FAIR	1-IMMINENT FAILURE
8-VERY GOOD	4-POOR	0-FAILURE
7-GOOD	3-SERIOUS	
6-SATISFACTORY	2-CRITICAL	

.S

TH SIDE OF CULVERT HAS A 3-SPAN ARCH OPENING

TOM OF ONE OF THE ARCH OPENINGS IS EXPOSED

SIGNED ____________ INSPECTOR

REVIEWED Will Vancel SUPERVISOR

WILLOW POND ROAD

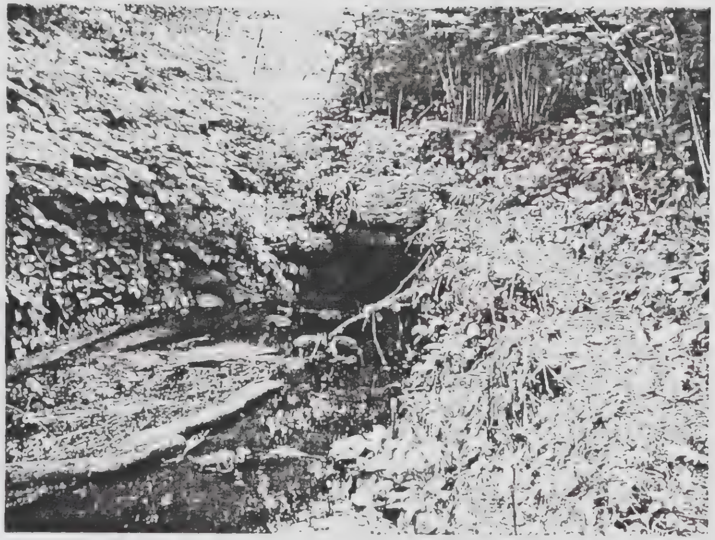


Figure 65: Downstream Elevation

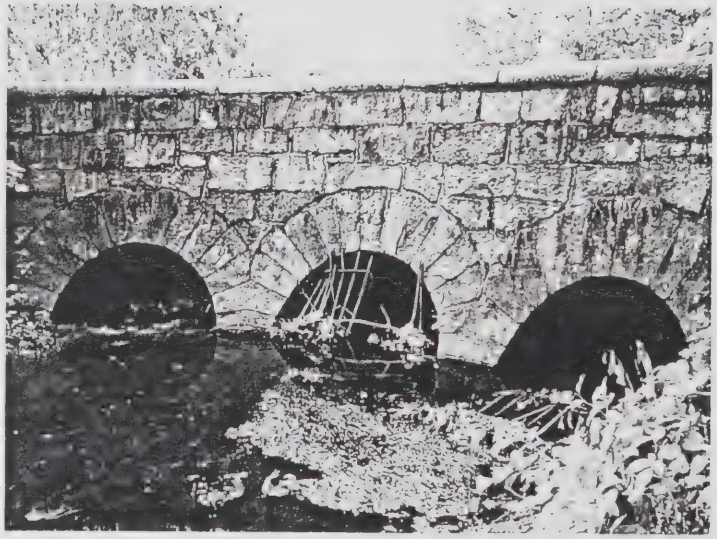
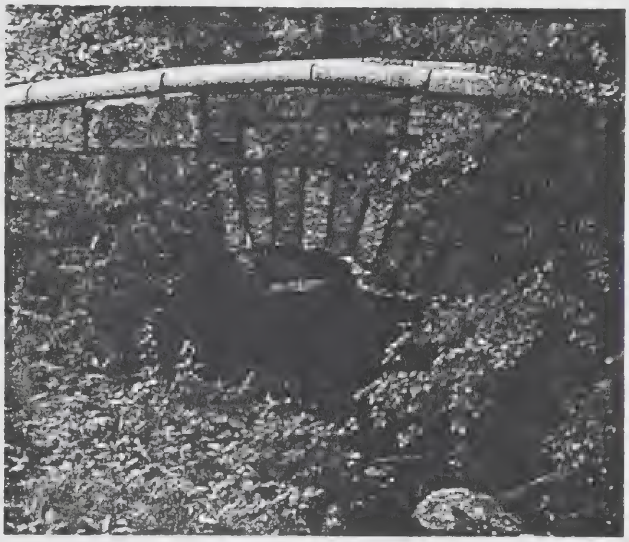


Figure 66: Upstream Elevation

MUDDY RIVER-BRIDGE INVENTORY

SPECTOR(S): Brant Ballantyne INSPECTION DATE: 6/9/00

AL INFORMATION



'Y/TOWN: Boston

IDGE NAME: Willow Pond #2

IDGE NUMBER:

IDGE OWNER: Boston Parks & Rec. Dept.

IDGE TYPE: Brick Arch W/ Façade

IDGE USAGE: Pedestrian

TE OF CONSTRUCTION: 1892

TE(S) OF REHABILITATION:

ER: Pedestrian Walkway

DER: Muddy River (Stream)

GEOMETRY

TAL LENGTH: 9 (FT) (IN)

MBER OF SPANS: 1 @ 9 (FT) (IN)

MBER OF PIERS:

DGE WIDTH: (OUT-TO-OUT) 16 (FT) 0 (IN)

MBER OF TRAVEL LANES:

MBER OF SIDEWALKS: 1 @ 12 (FT) 0 (IN)

DIAN: (~~YES~~/NO) (FT) (IN)

PE OF RAILING: Stone masonry

PE OF FENCING:

'URAL CONDITION

GENERAL	CONDITION
PROACH	7
CK/TOPPING	6
DSION	
OUR	
LING	7
NT	

ABUTMENTS	CONDITION (1)	CONDITION (2)
STEM		
WINGWALLS	8	8
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING	6	6
FOOTING		
SETTLEMENT		

PIERS	CONDITION
PILES	
FOOTINGS	
PIER PROTECTION	
STEM OR COLUMNS	
CAP BEAMS	
PEDESTALS	
DIAGONAL BRACING	
SETTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	
BOTTOM FLANGE	
WEB	
STIFFENERS	
RIVETS/BOLTS	
WELDS	
GUSSETS	
DIAPHRAGMS	

ARCH BRIDGES	CONDITION
KEYSTONE AREA	7
ARCH RING	7
SPRINGLINE	7
SPANDREL WALLS	8
FAÇADE	7
FOOTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	7

RATING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY
5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL
1-IMMINENT FAILURE
0-FAILURE

REMARKS

SIGNED ____________________ INSPECTOR

REVIEWED ____________________ SUPERVISOR

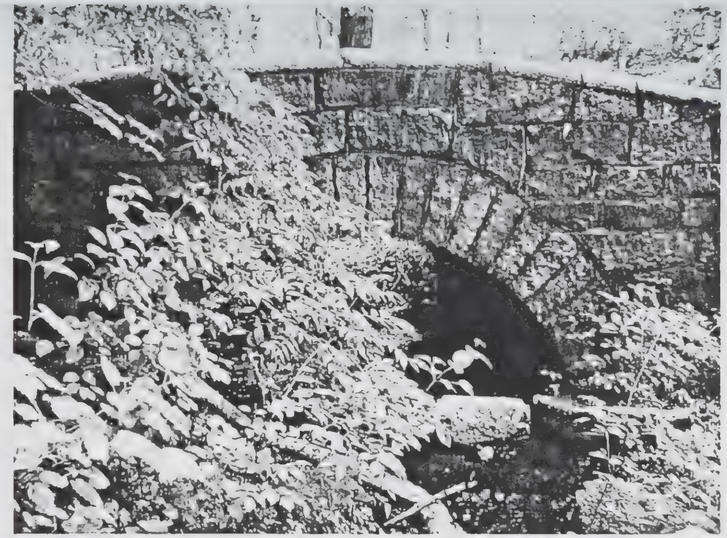


Figure 68: Downstream Elevation

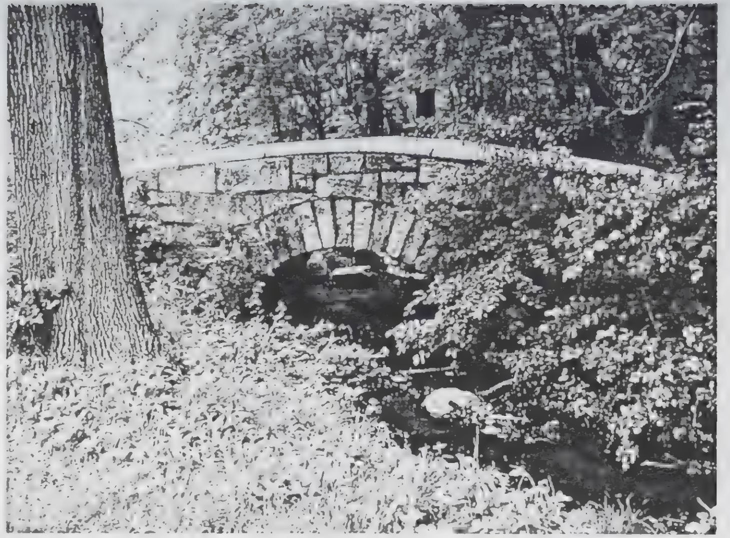


Figure 69: Upstream Elevation

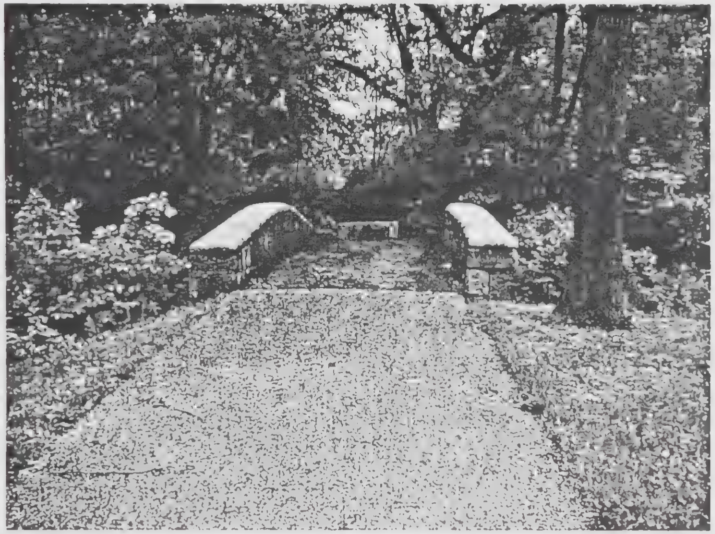


Figure 70: West Approach

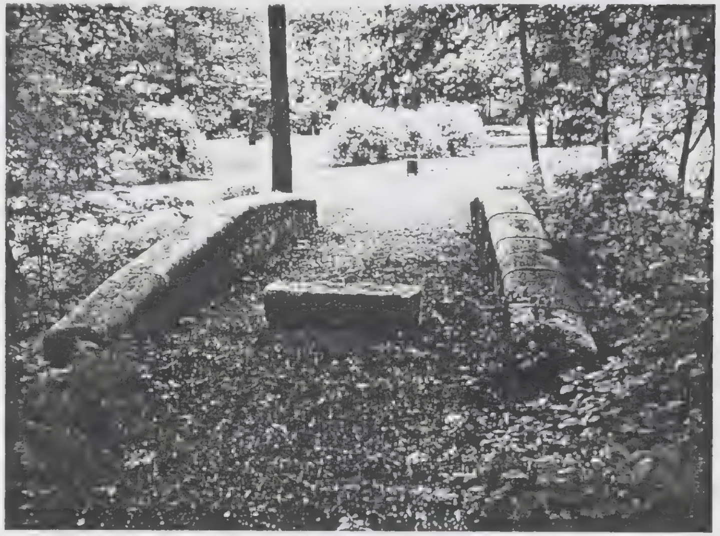


Figure 71: East Approach

MUDDY RIVER-BRIDGE INVENTORY

INSPECTOR(S): Brant Ballantyne INSPECTION DATE: 6/9/00

GENERAL INFORMATION

CITY/TOWN: Boston

BRIDGE NAME: Ward's Pond

BRIDGE NUMBER:

BRIDGE OWNER: Boston Parks & Rec. Dept.

BRIDGE TYPE: Brick Arch W/ Façade

BRIDGE USAGE: Pedestrian

DATE OF CONSTRUCTION: 1892

DATE(S) OF REHABILITATION:

OVER: Pedestrian Walkway

UNDER: Muddy River (Stream)

BRIDGE GEOMETRY

TOTAL LENGTH: 6 (FT) (IN)

NUMBER OF SPANS: 1 @ 6 (FT) (IN)

NUMBER OF PIERS:

BRIDGE WIDTH: (OUT-TO-OUT) 19 (FT) 0 (IN)

NUMBER OF TRAVEL LANES:

NUMBER OF SIDEWALKS: 1 @ 15 (FT) 0 (IN)

MEDIAN: (~~YES~~/NO) (FT) (IN)

TYPE OF RAILING: Stone masonry

TYPE OF FENCING:

STRUCTURAL CONDITION

GENERAL	CONDITION
APPROACH	6
DECK/TOPPING	6
EROSION	7
SCOUR	7
RAILING	8
PAINT	

ABUTMENTS	CONDITION (1)	CONDITI
STEM		
WINGWALLS	8	8
PEDESTALS		
BRIDGE SEATS		
PARAPET		
POINTING	6	6
FOOTING		
SETTLEMENT	7	7

PIERS	CONDITION
LES	
OTINGS	
ER PROTECTION	
EM OR COLUMNS	
P BEAMS	
DESTALS	
AGONAL BRACING	
TTLEMENT	

GIRDERS	CONDITION
TOP FLANGE	
BOTTOM FLANGE	
WEB	
STIFFENERS	
RIVETS/BOLTS	
WELDS	
GUSSETS	
DIAPHRAGMS	

ARCH BRIDGES	CONDITION
YSTONE AREA	7
CH RING	7
RINGLINE	6
ANDREL WALLS	7
ÇADE	7
OTING	

CULVERTS	CONDITION
BARREL	
HEADWALL	
CUTOFF WALL	
PORTALS	
FOOTING	

OVERALL RATING	7

TING VALUES

9-EXCELLENT
8-VERY GOOD
7-GOOD
6-SATISFACTORY

5-FAIR
4-POOR
3-SERIOUS
2-CRITICAL

1-IMMINENT FAILURE
0-FAILURE

KS

SSING A BRICK IN ARCH BARREL
RTAR DETERIORATION AT SPRINGLINE

SIGNED ______________ INSPECTOR

REVIEWED Will. Varnell SUPERVISOR

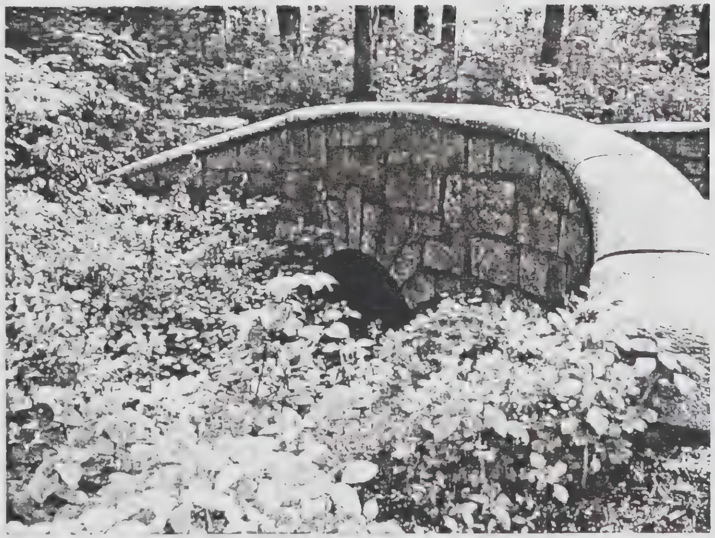


Figure 72: Downstream Elevation

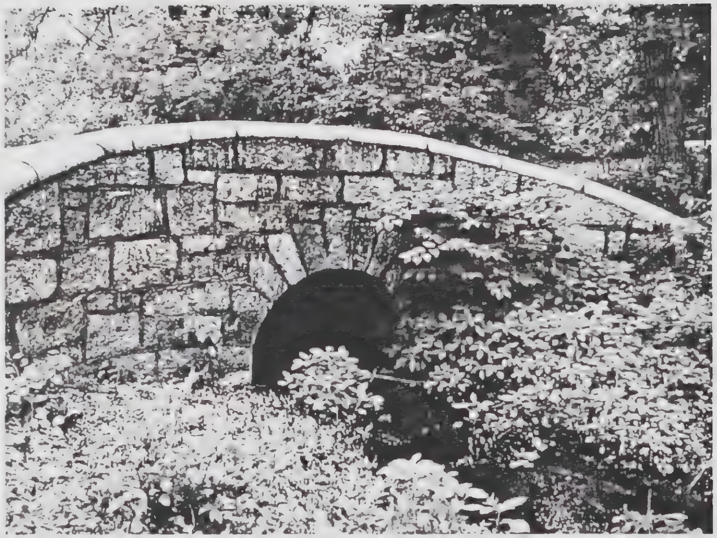
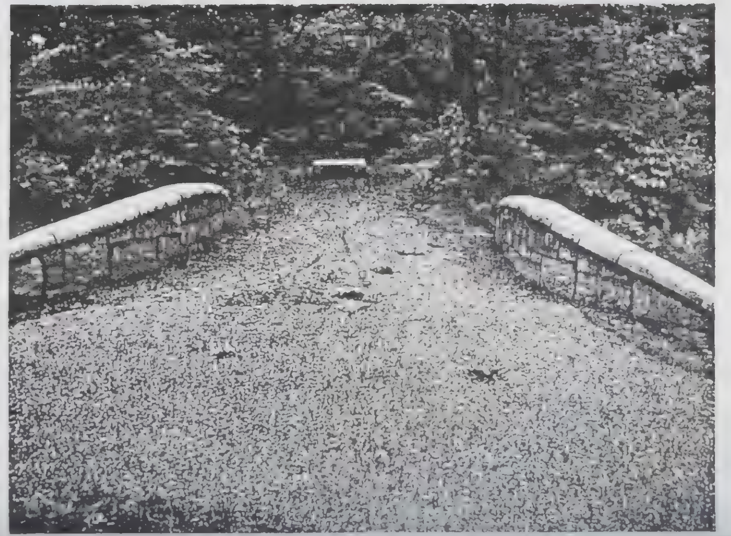
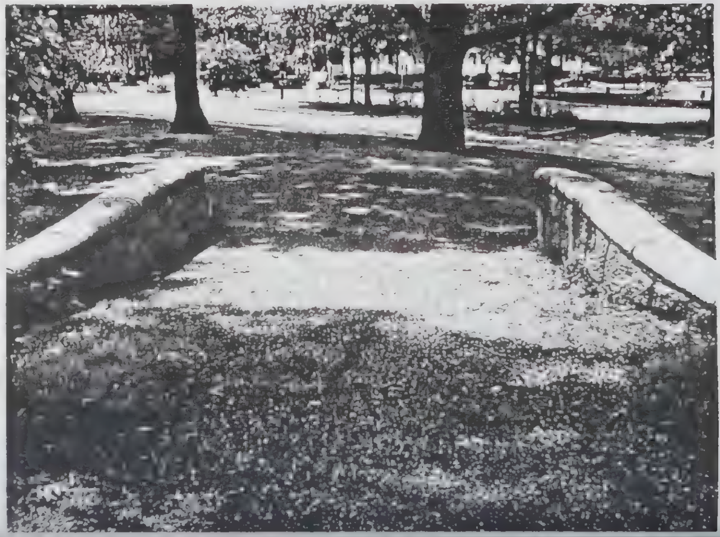


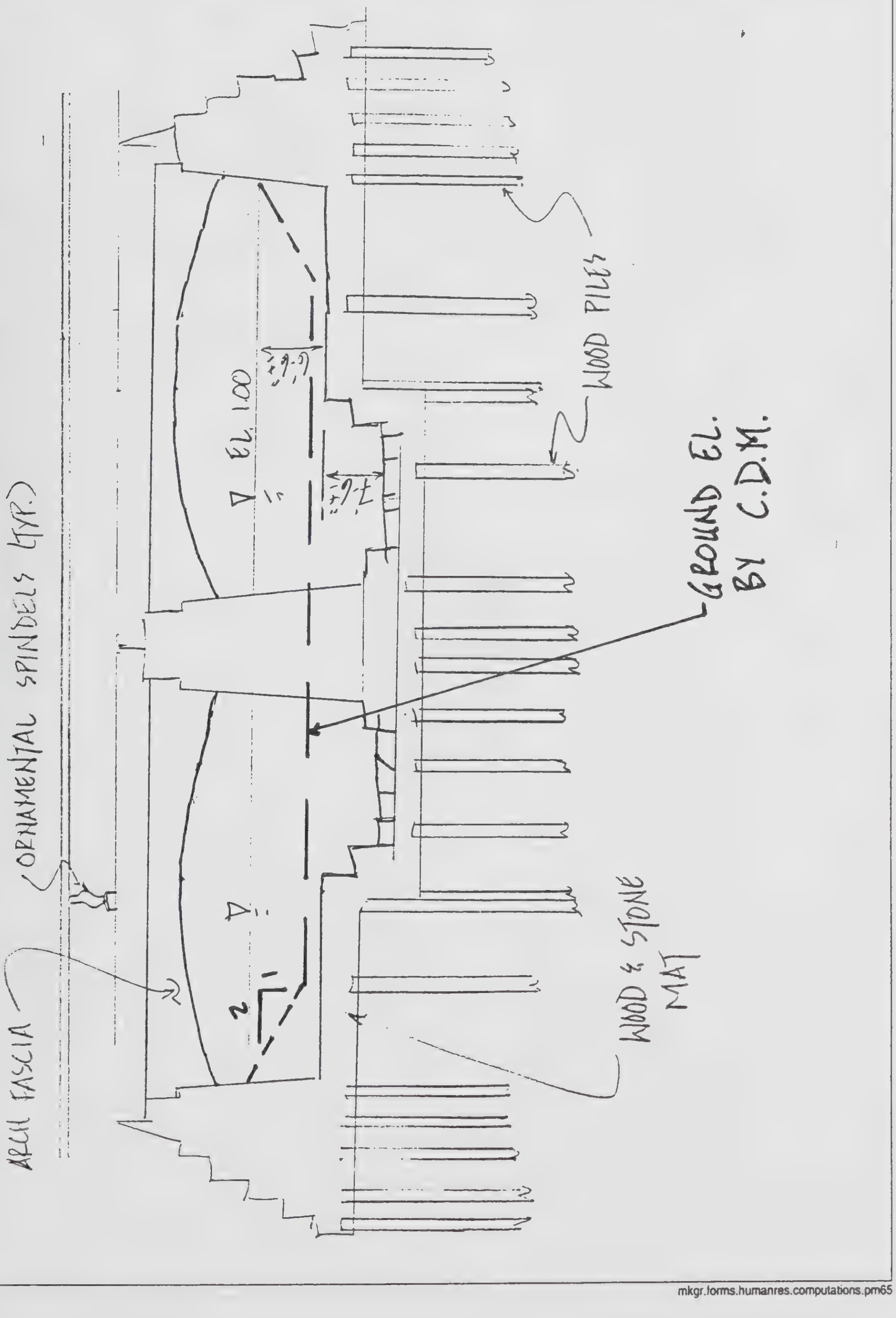
Figure 73: Upstream Elevation





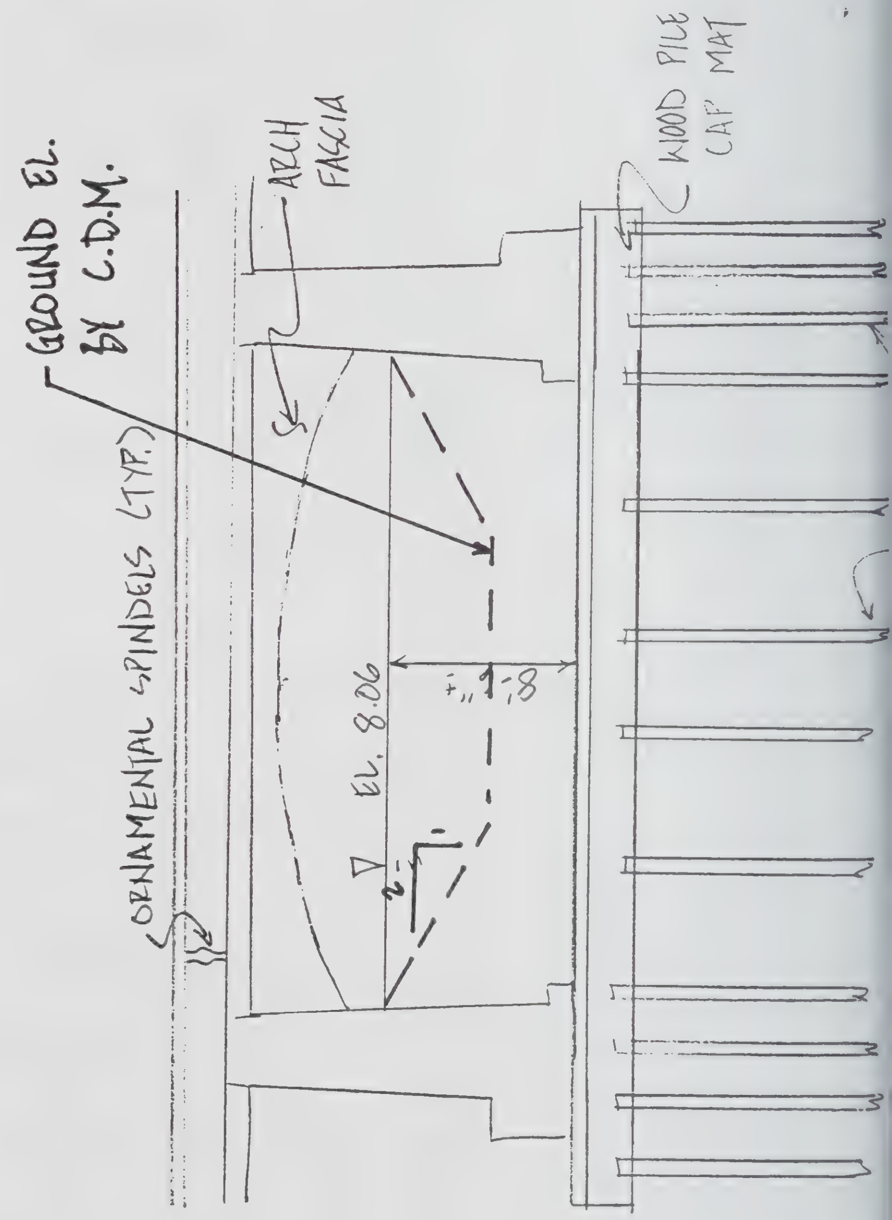
PPENDIX B-“LIMITS OF DREDGEING” SKETCHES

Project: MUDDY RIVER
Project # 06967
Location: BOSTON
Sheet of
Calculated by: BFB
Date:
Checked by:
Date:
Title BEACON STREET ELEVATION



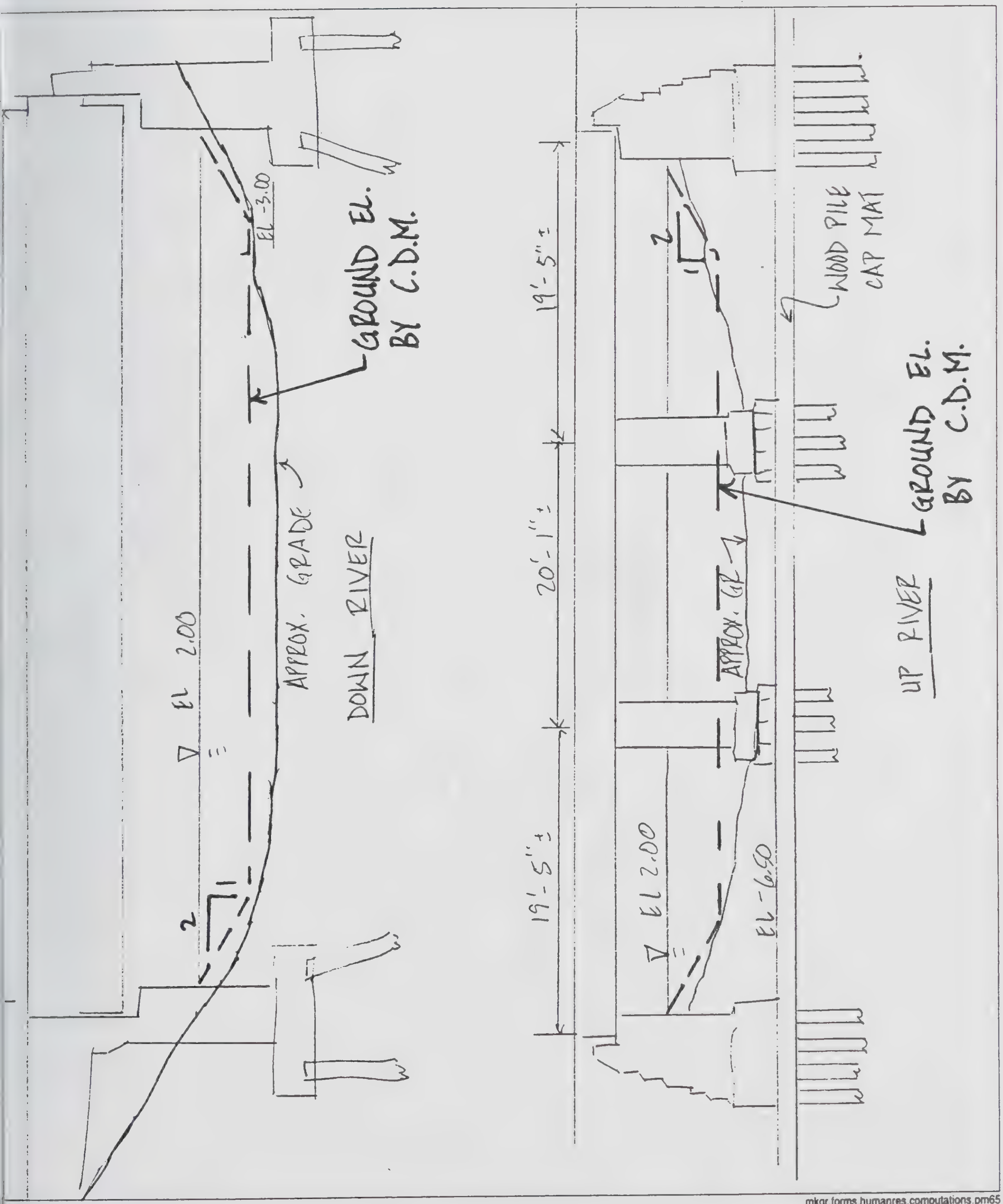
Computations

Project: MUDDY RIVER
Project # 06967
Location: BOSTON
Sheet of
Calculated by: BFB
Date:
Checked by:
Date:
Title COMMONWEALTH AVE ELEVAT

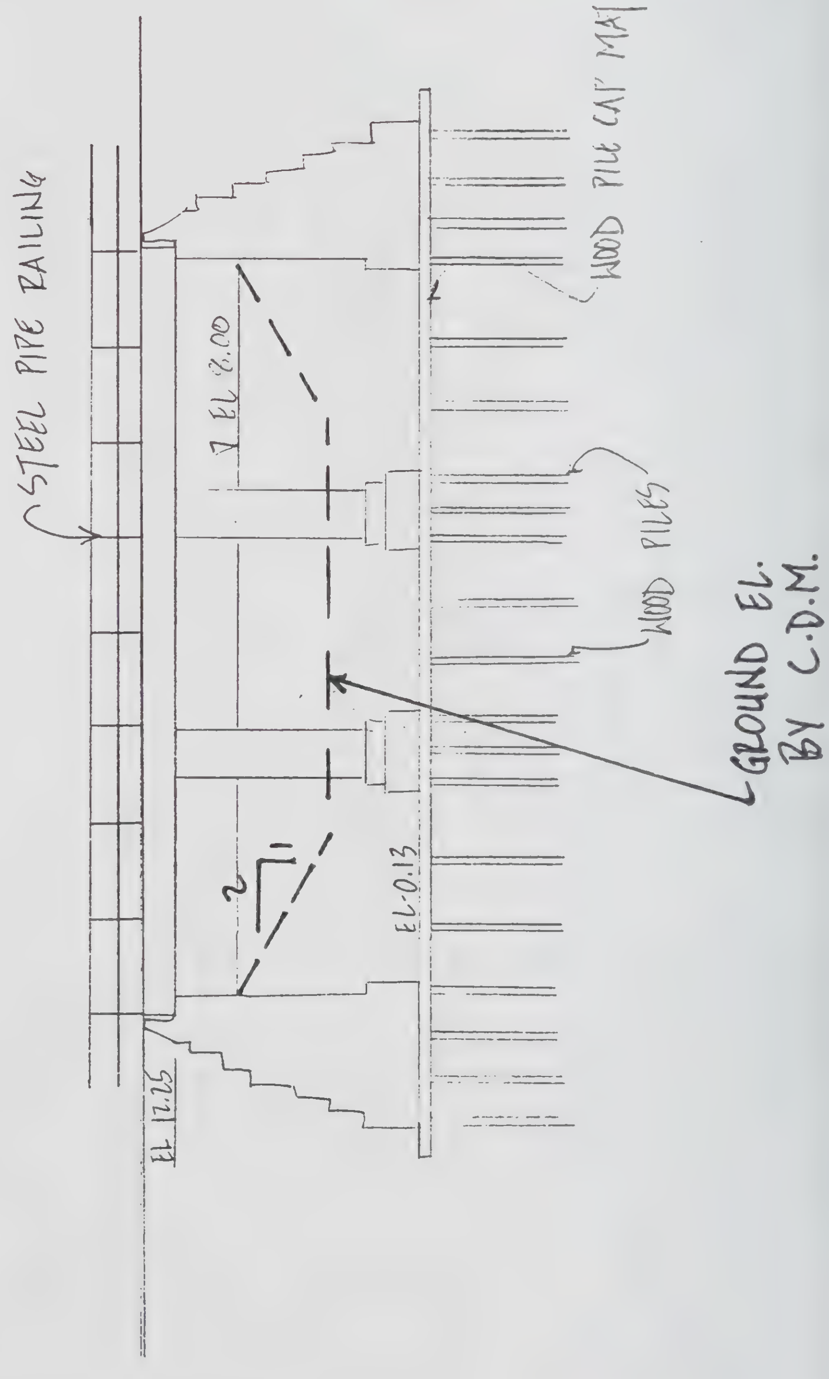


Computations

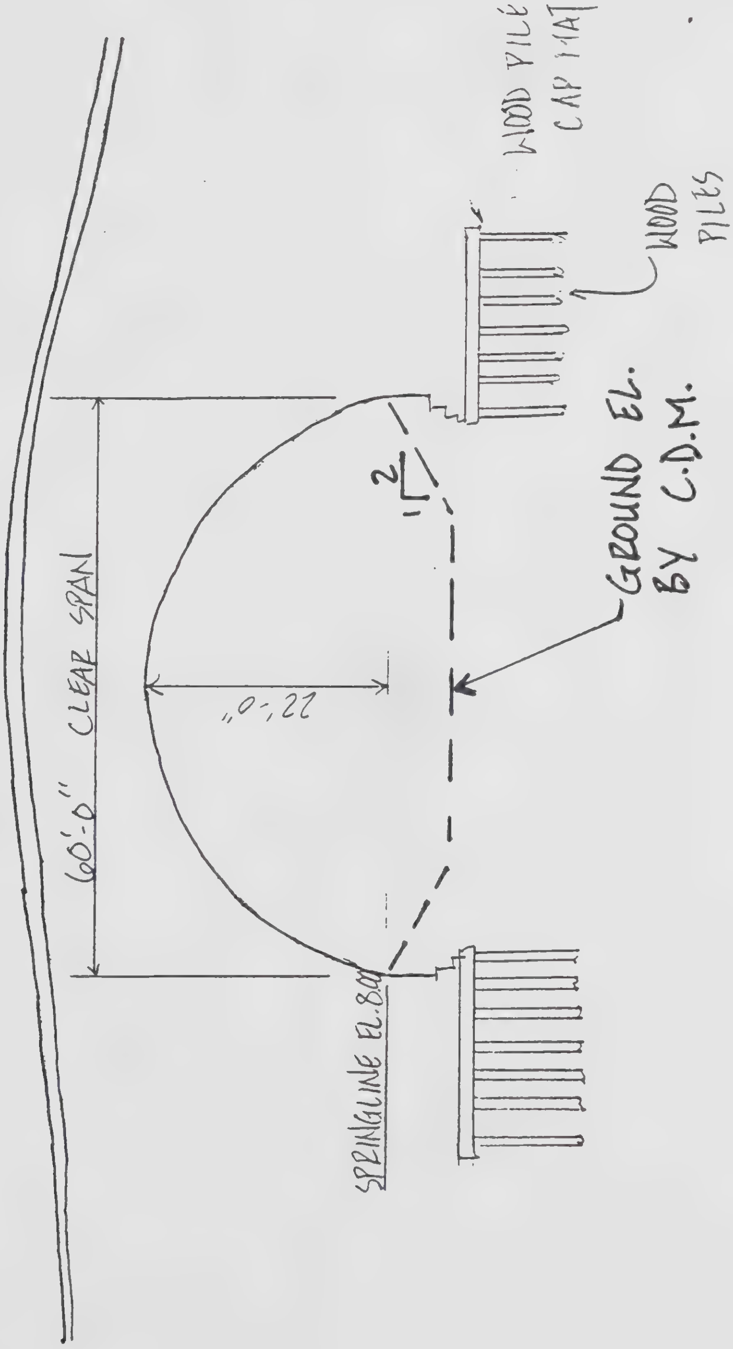
Project: MUDDY RIVER
Project # 06967
Location: BOSTON
Sheet of
Calculated by: BFB
Date:
Checked by:
Date:
Title I-90 ELEVATIONS



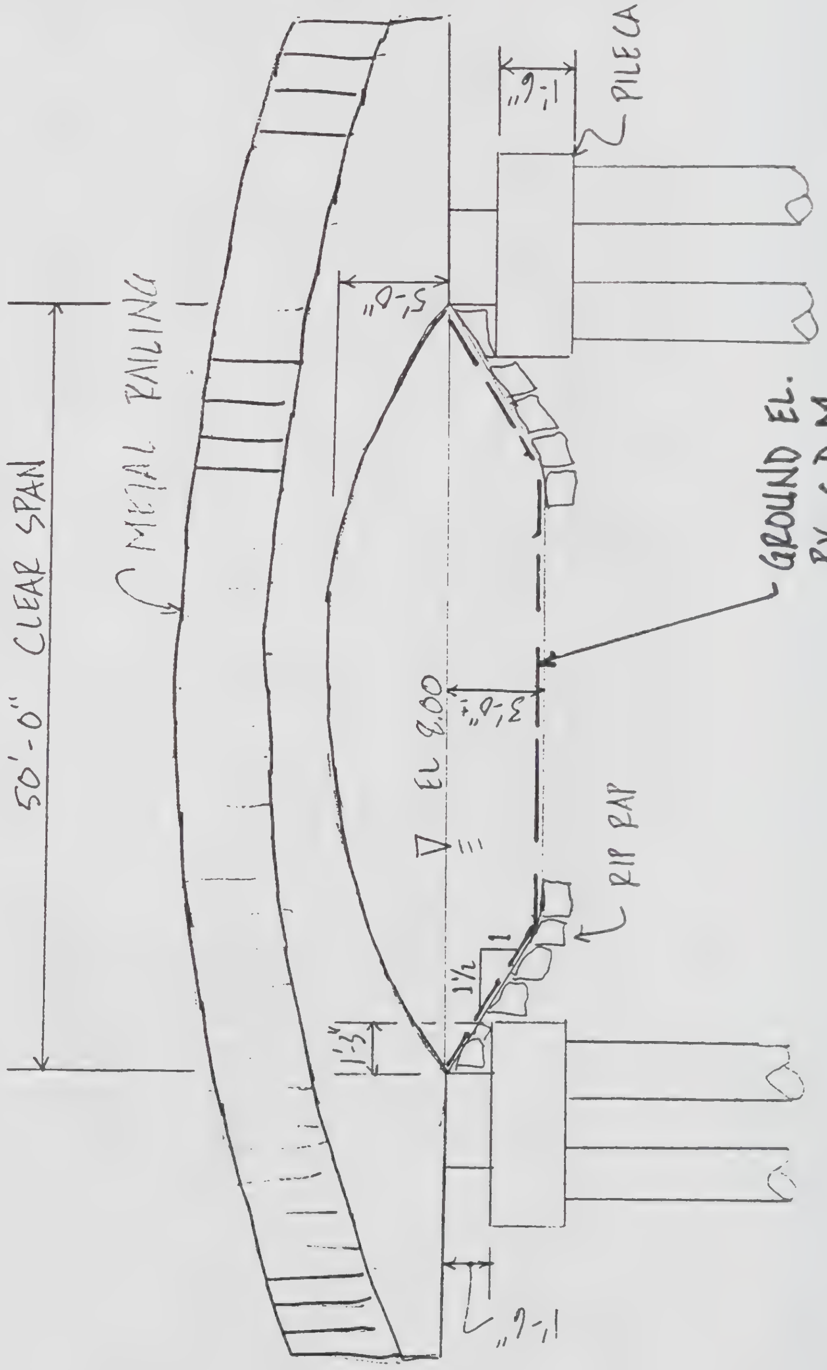
Project: MUDDY RIVER
Project # 06967
Location: BOSTON
Sheet of
Calculated by: BFB
Date:
Checked by:
Date:
Title IPSWICH ST & RR CROSSING -



Project: MUDDY RIVER
Project #
Location: BOSTON
Sheet of
Calculated by: BFB
Date:
Checked by:
Date:
Title BOYLSTON STREET ELEVATION



Project: MUDDY RIVER
Project # 06967
Location: BOSTON
Sheet of
Calculated by: BFB
Date:
Checked by:
Date:
Title BACKBAY FENS BRIDGES ELEVAT



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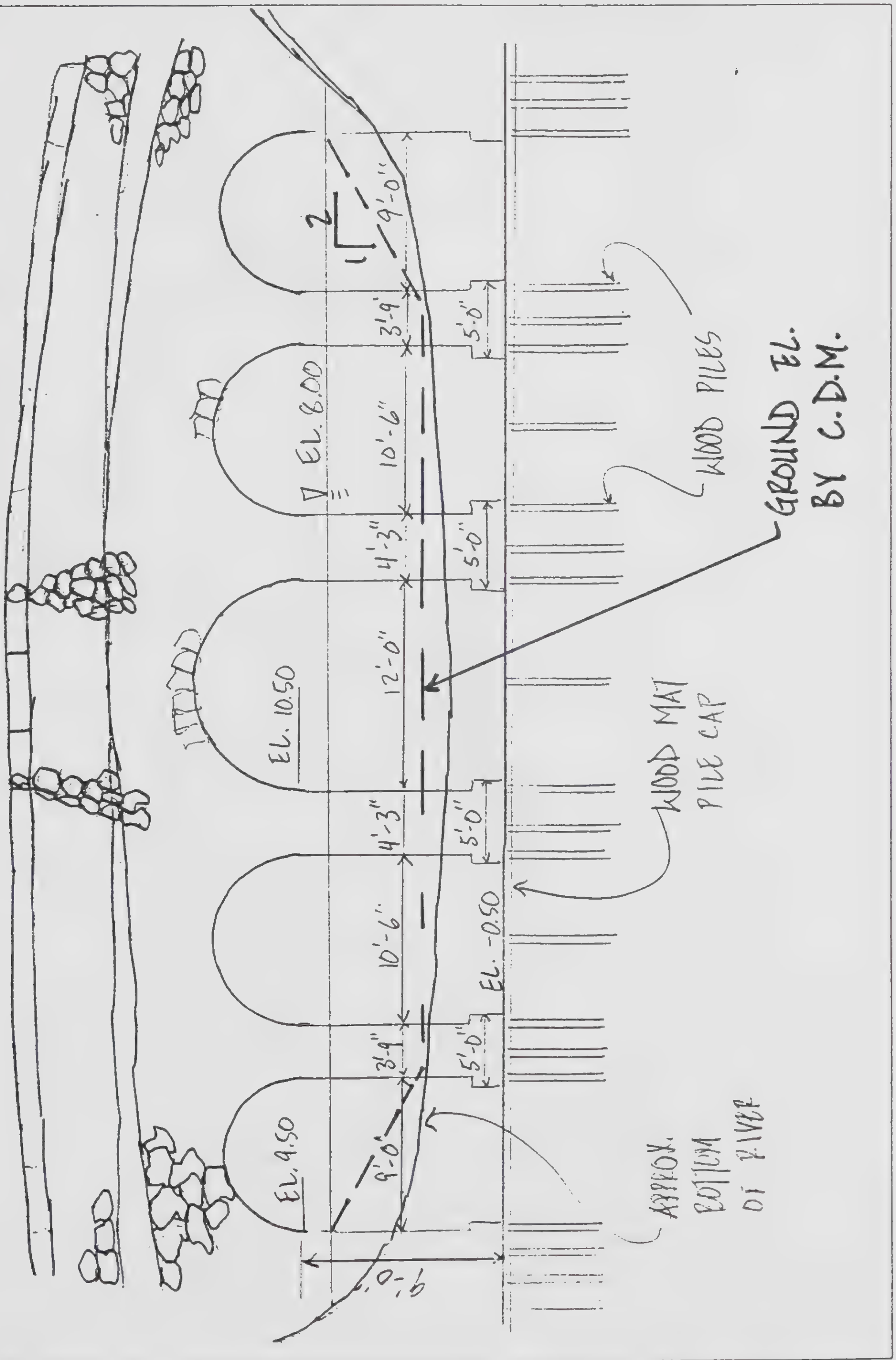
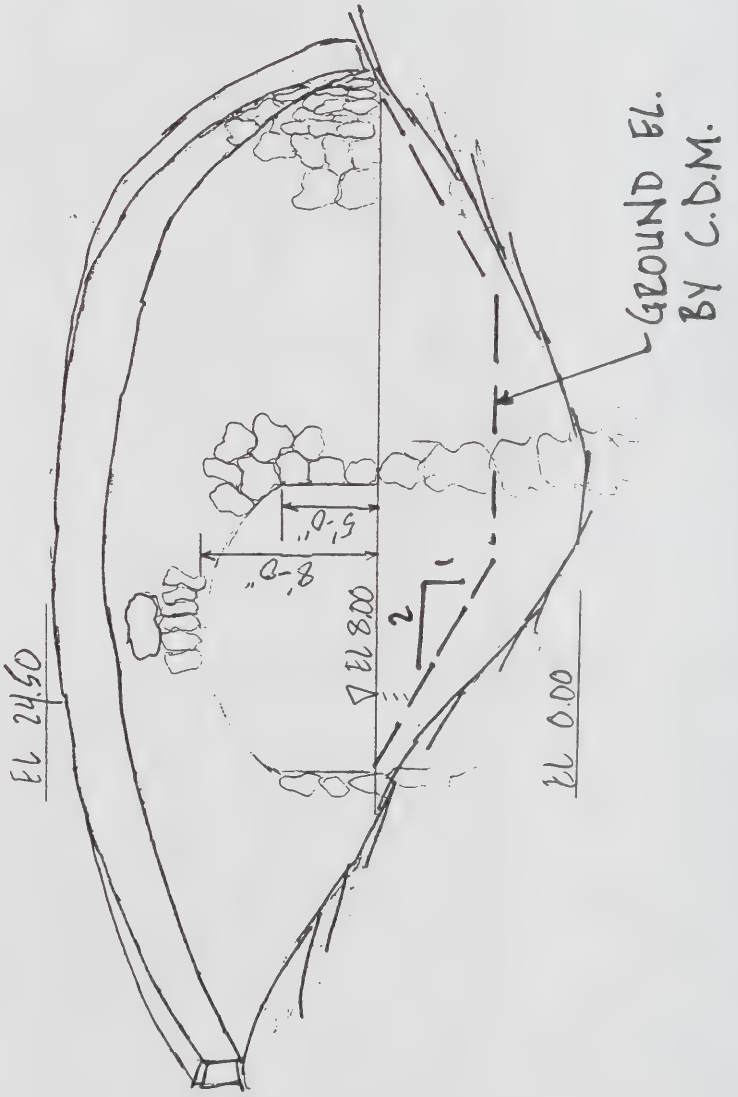
Project: MUDDY RIVER
Location: BOSTON
Calculated by: BFB
Checked by:
Title AGASSIZ BRIDGE - ELEVATION

Project #
Sheet of
Date:
Date:



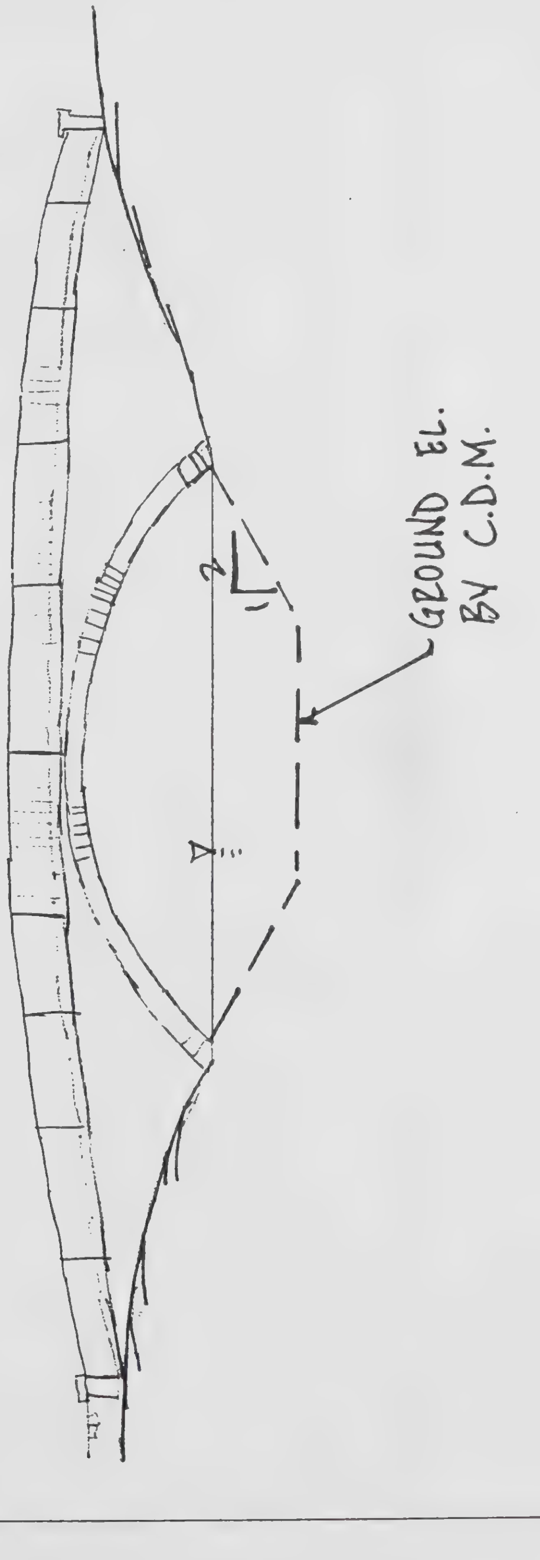
Computations

Project: MUDDY RIVER
Project # 0696
Location: BOSTON
Sheet of
Calculated by: BFB
Date:
Checked by:
Date:
Title AVE. LOUIS PASTEUR ELEVATIO



Computations

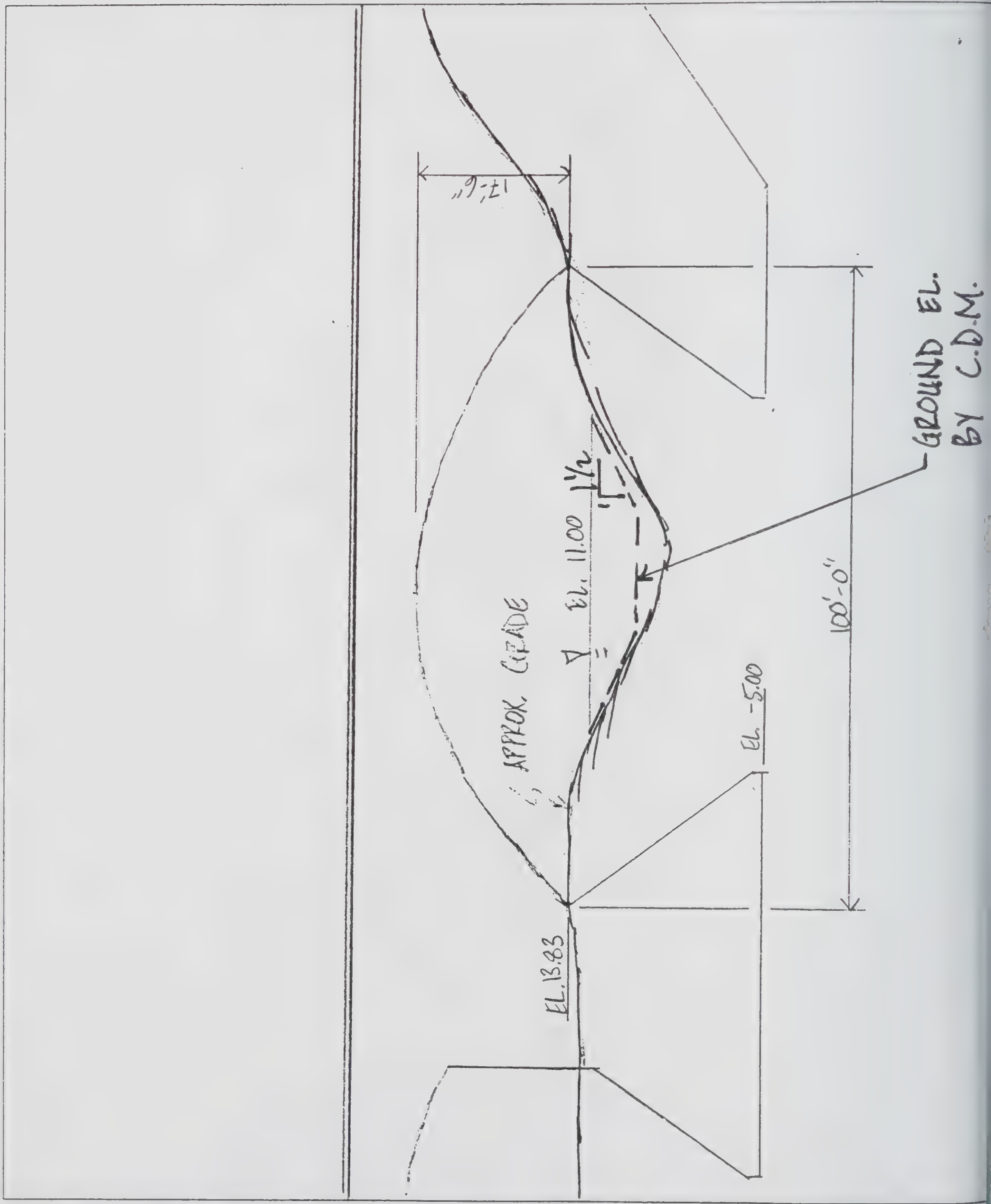
Project: MUDDY RIVER
Project # 06967
Location: BOSTON
Sheet of
Calculated by: BFB
Date:
Checked by:
Date:
Title RIVERWAY ACCESS TO MBTA - ELEVATION



VHB *Computations*

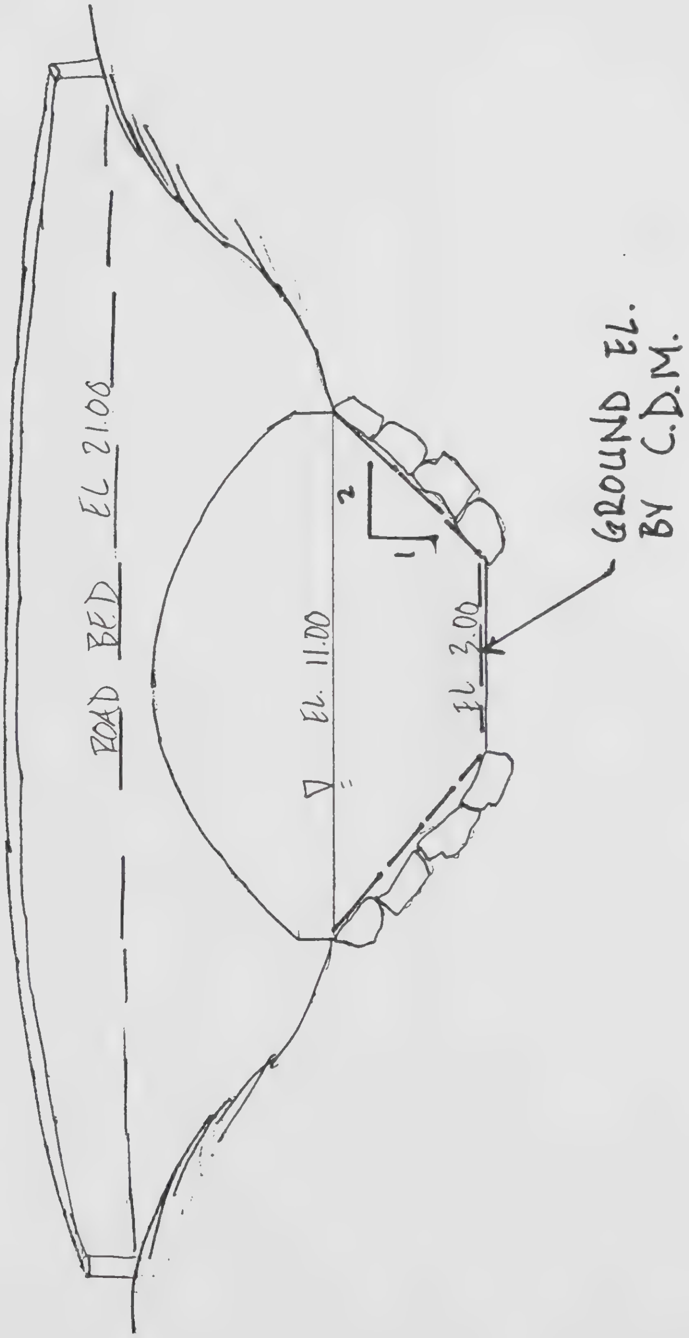
Project: MUDDY RIVER
Location: BOSTON
Calculated by: BFB
Checked by:
Title LONGWOOD AVE ELEVATION

Project # 06916
Sheet of
Date:
Date:

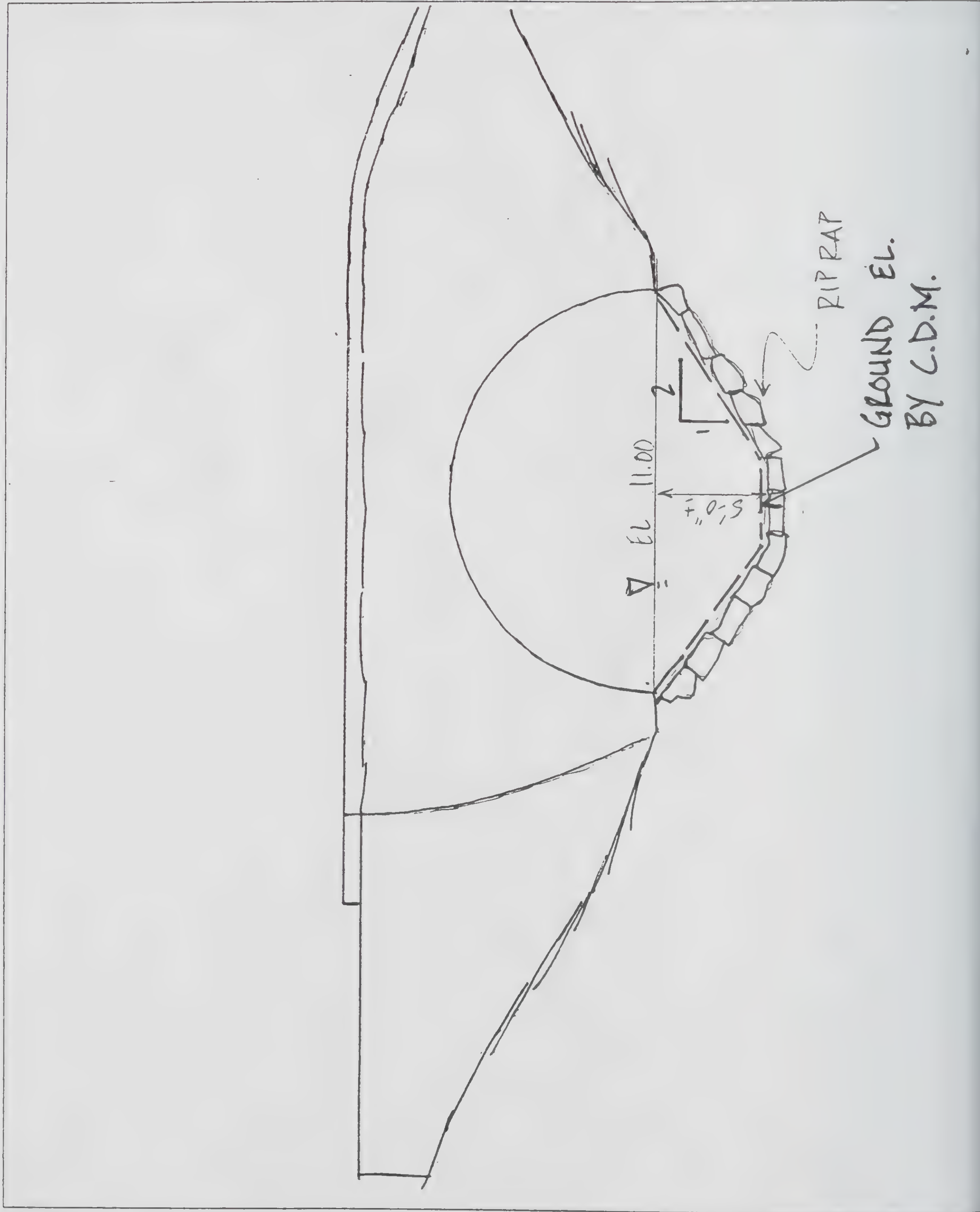


Project:	MUDDY RIVER	Project #	06967
Location:	BOSTON	Sheet	of
Calculated by:	BFB	Date:	
Checked by:		Date:	

Title NETHERLANDS RD - ELEVATION

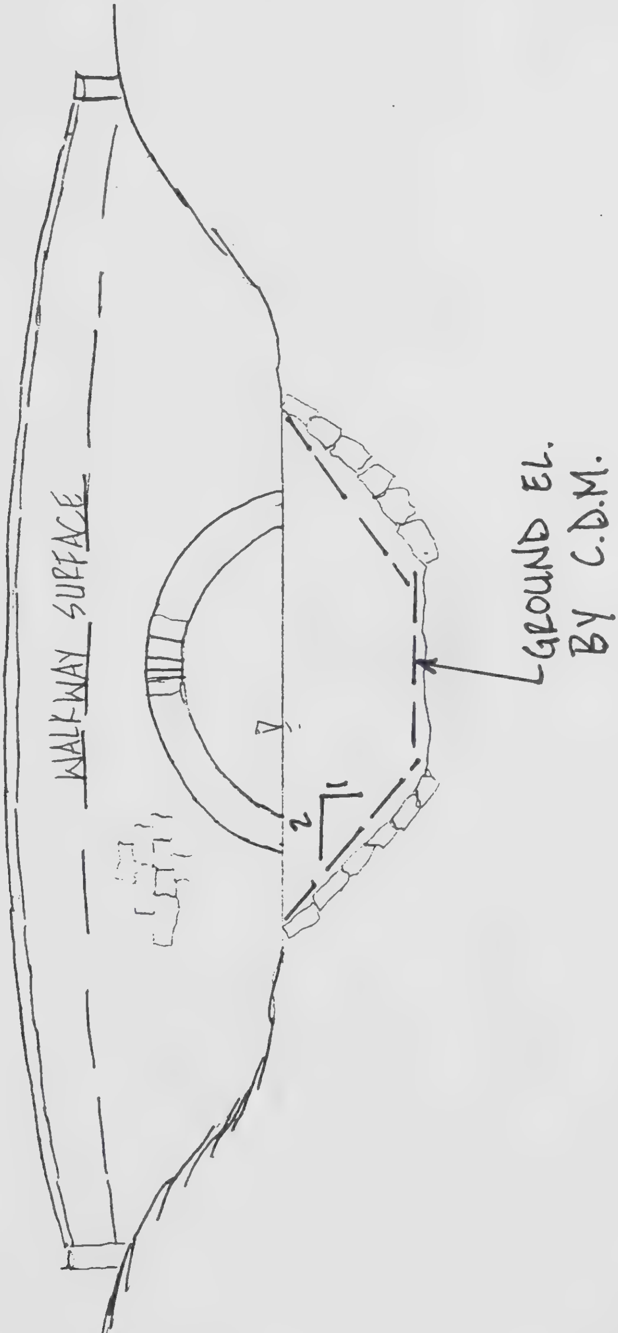


Project: MUDDY RIVER Project # 06967
Location: BOSTON Sheet of
Calculated by: BFB Date:
Checked by: Date:
Title ISLAND BRIDGE #1 ELEVATION



Computations

Project: MUDDY RIVER
Project # 06967
Location: BOSTON
Sheet of
Calculated by: BFB
Date: 7·11·00
Checked by:
Date:
Title ISLAND BRIDGE #2 ELEVATION

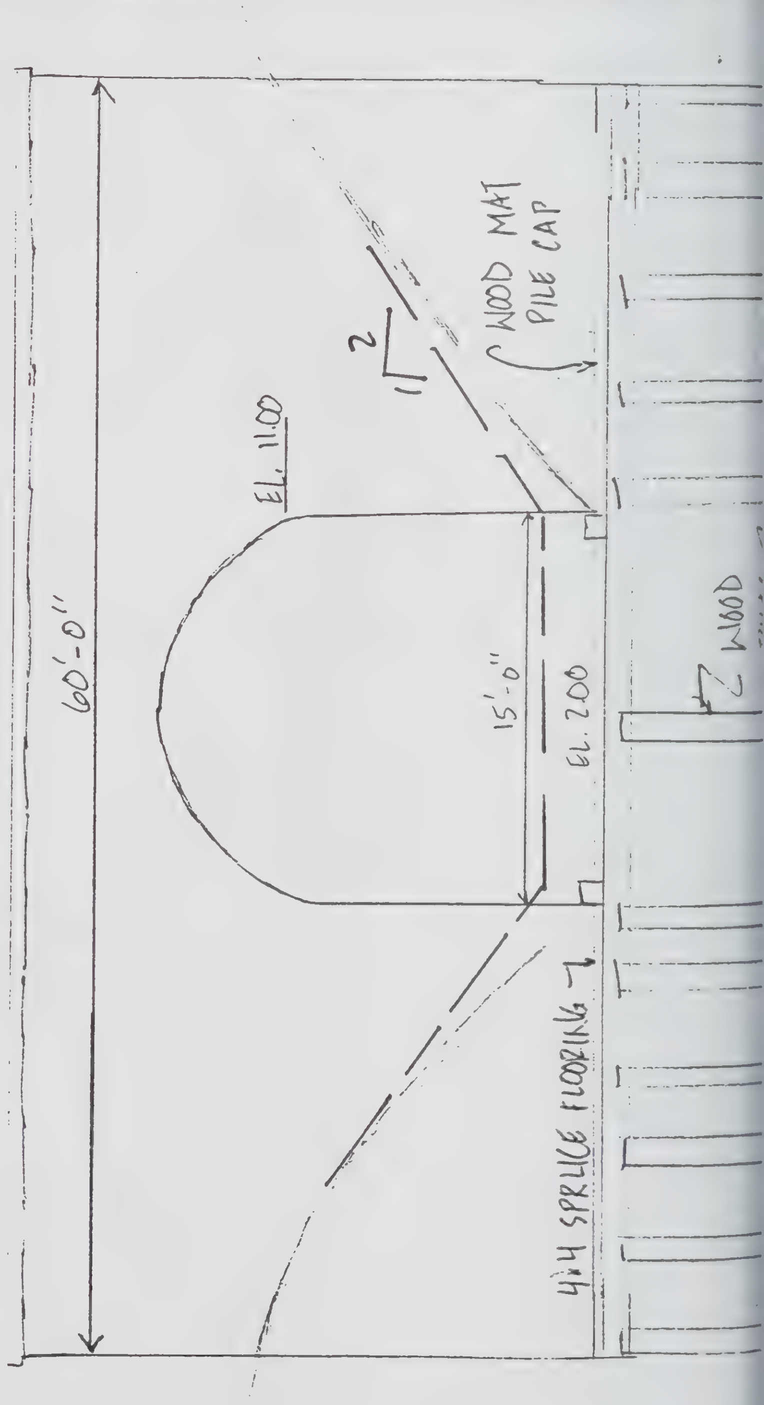


Computations

Project: MUDDY RIVER
Location: BOSTON
Calculated by: BFB
Checked by:
Title BROOKLINE AVE

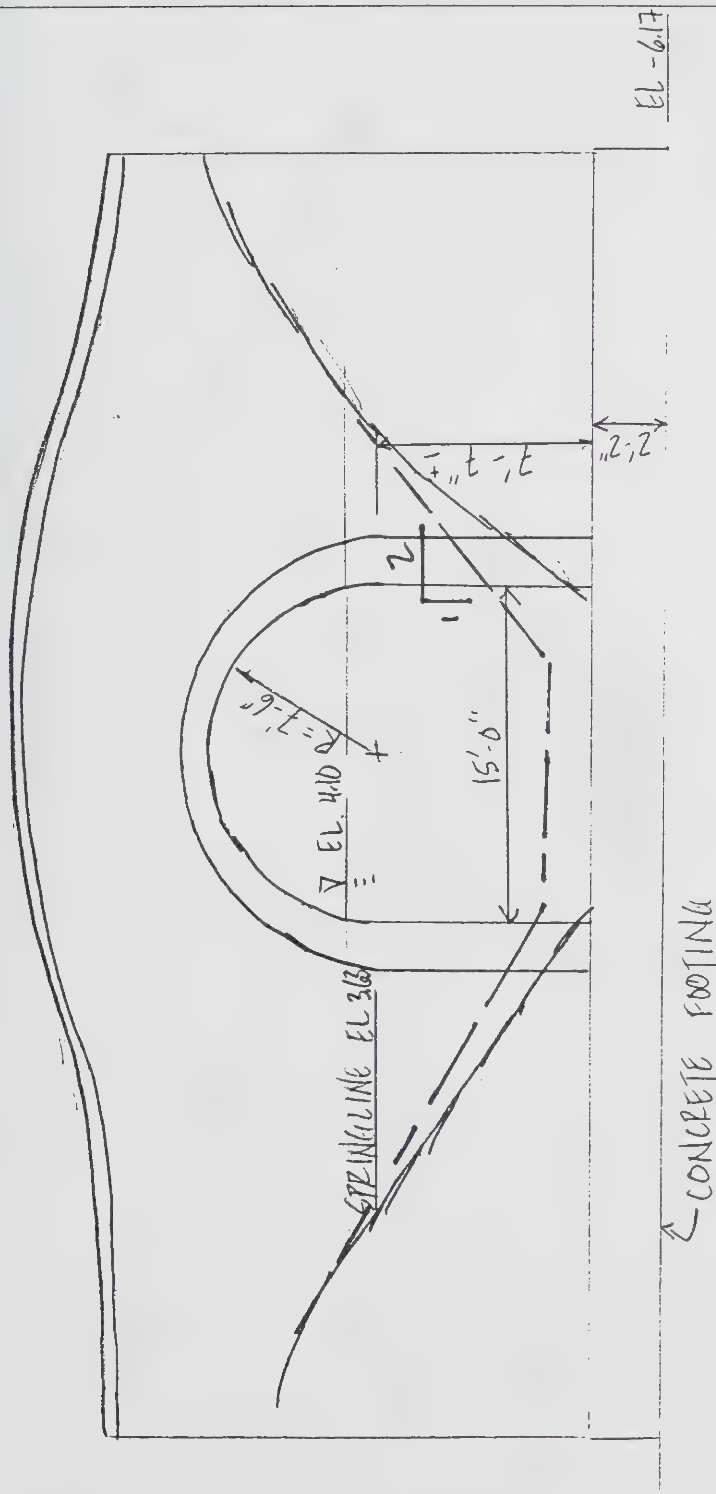
Project # 06967
Sheet of
Date:
Date:

ELEVATION



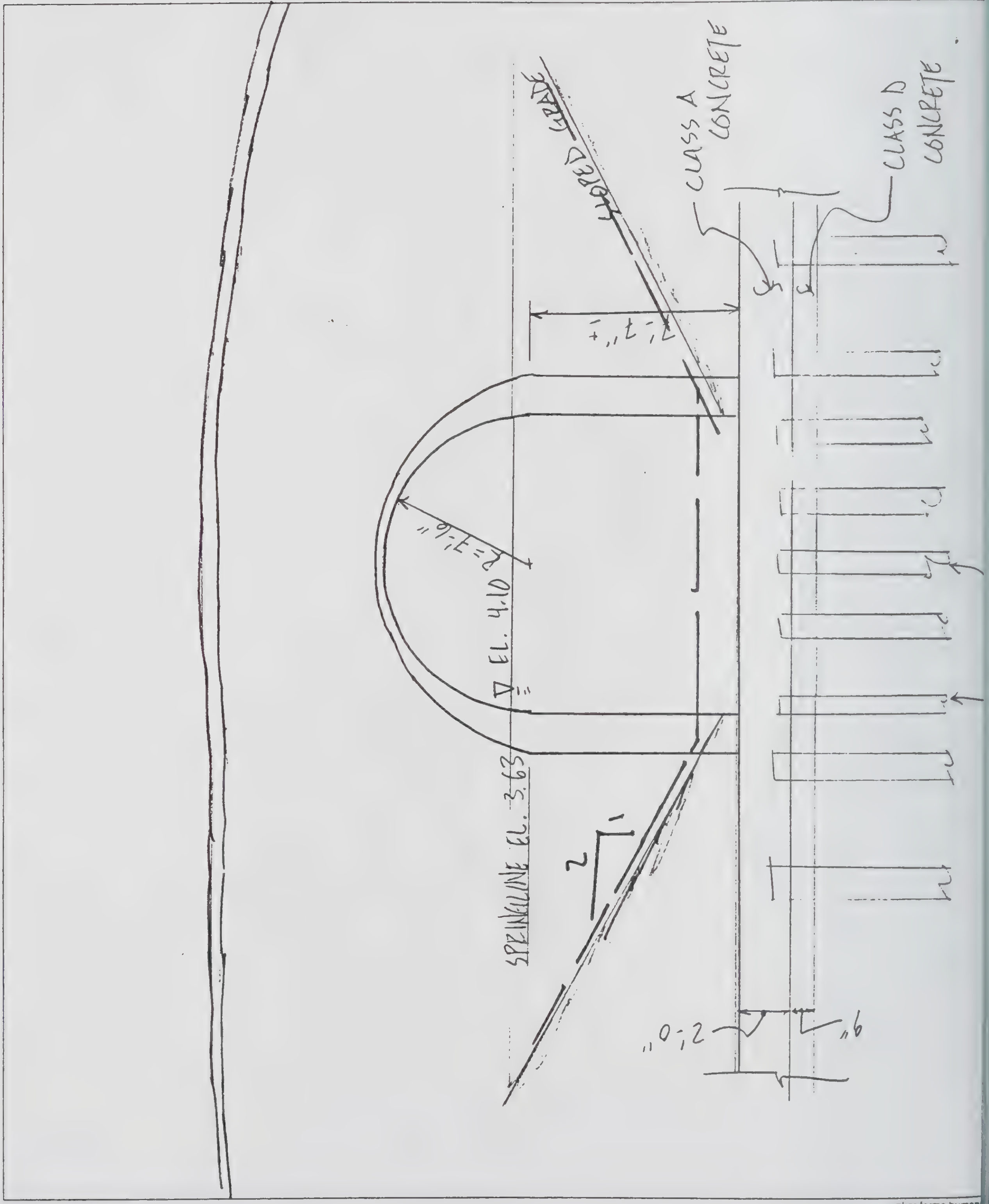
Computations

Project: MUDDY RIVER
Project # 06967
Location: BOSTON
Sheet of
Calculated by: BFB
Date:
Checked by:
Date:
Title JAMAICAWAY EXIT ELEVATION



VHB *Computations*

Project: MUDDY RIVER
Project # 06967
Location: BOSTON
Sheet of
Calculated by: BFB
Date:
Checked by:
Date:
Title ROUTE 9 CULVERT ELEVATION



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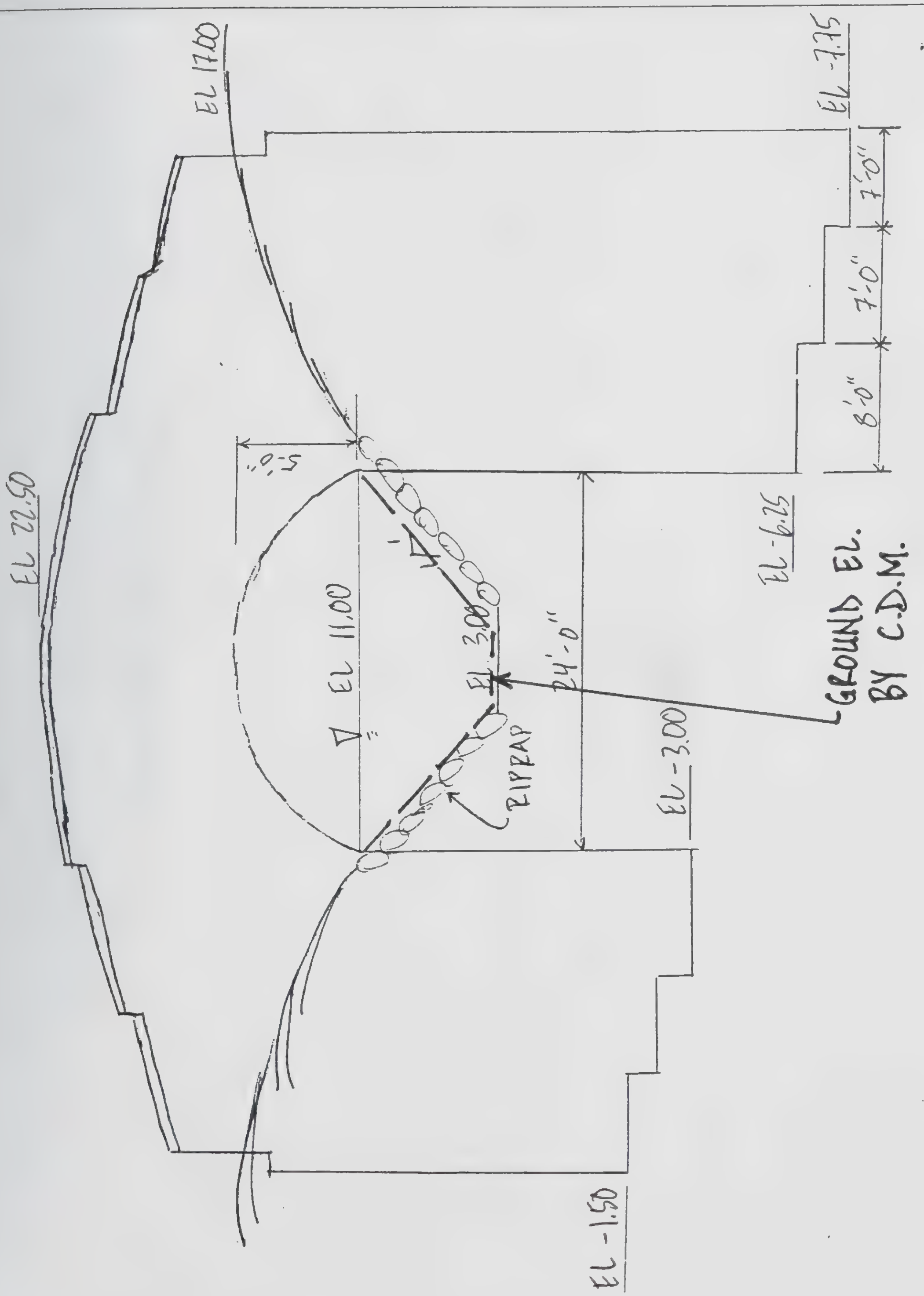
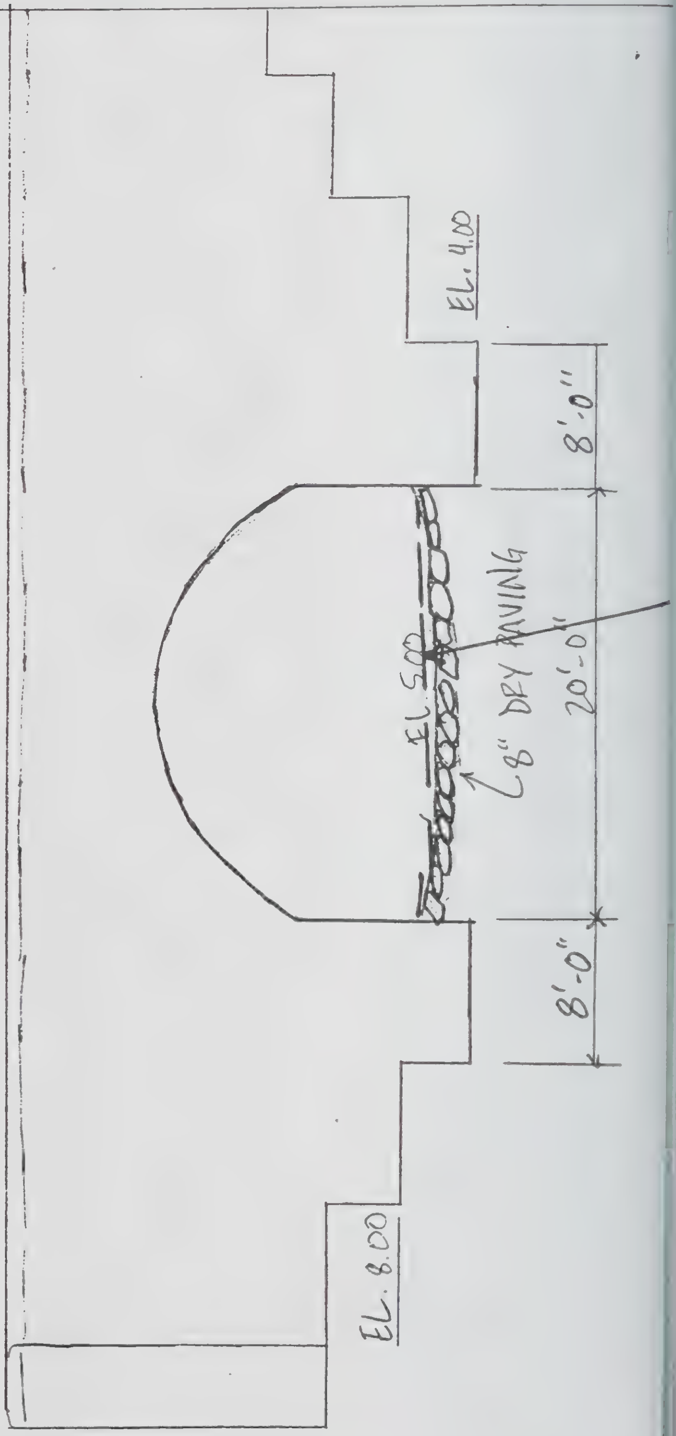
Project: MUDDY RIVER
Project # 06967
Location: BOSTON
Sheet of
Calculated by: BFB
Date:
Checked by:
Date:
Title COVE BRIDGE - ELEVATION



Project: MUDDY RIVER
Location: BOSTON
Calculated by: BFB
Checked by:
Title LEVERETT POND ELEVATION

Project # 06967
Sheet of
Date:
Date:



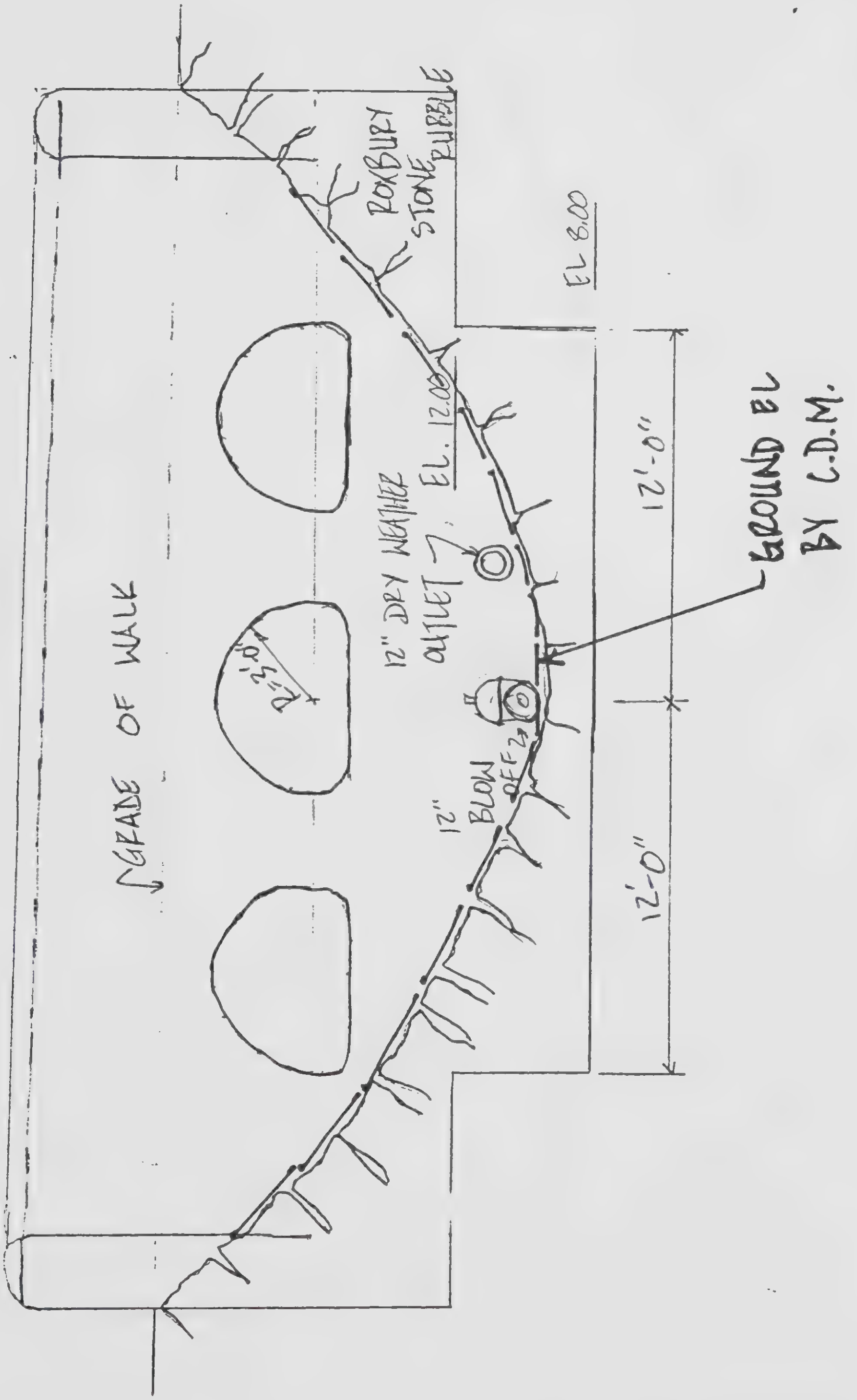
Project: MUDDY RIVER Project # 06967

Location: BOSTON Sheet of

Calculated by: BFB Date:

Checked by: Date:

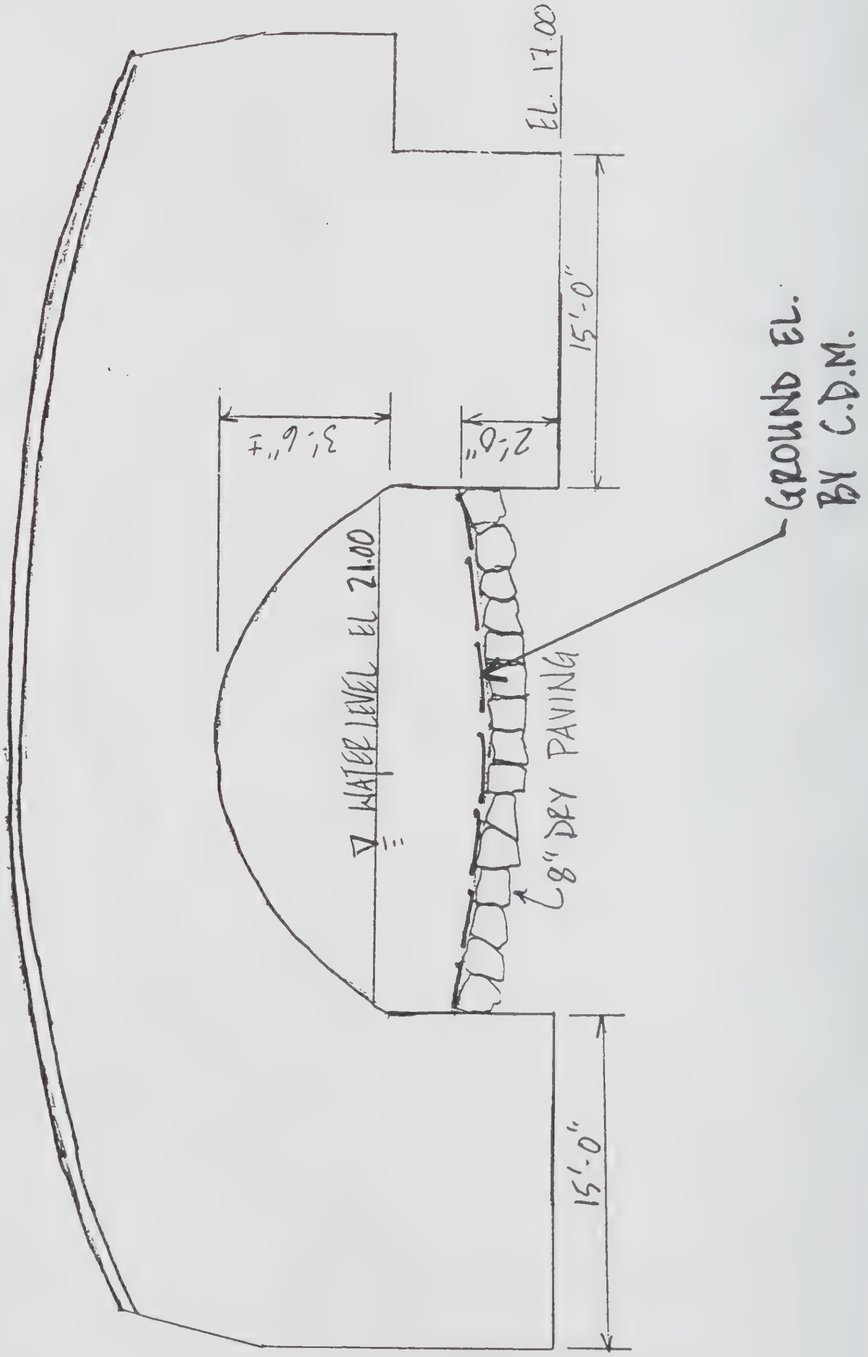
Title WILLOW POND ROAD ELEVATION



VHB

Computations

Project: MUDDY RIVER
Project # 06967
Location: BOSTON
Sheet of
Calculated by: BFB
Date:
Checked by:
Date:
Title WILLOW POND #2 ELEVATI



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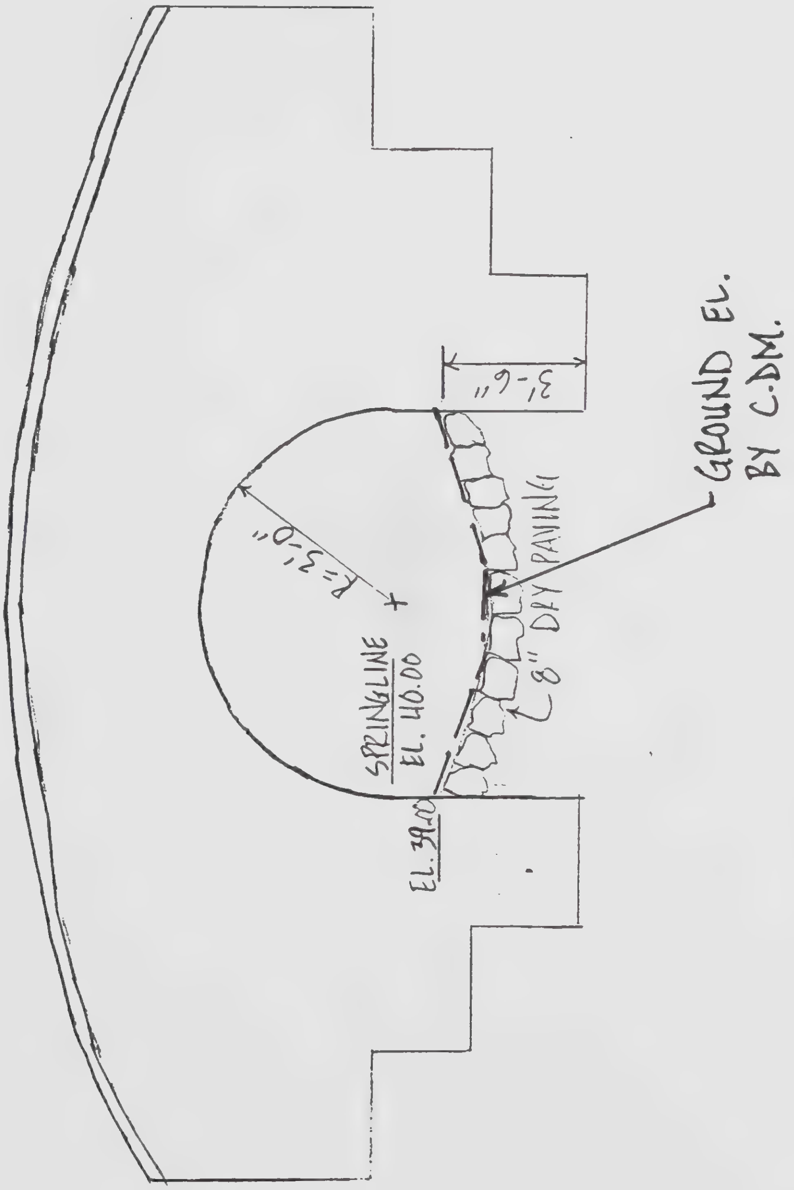
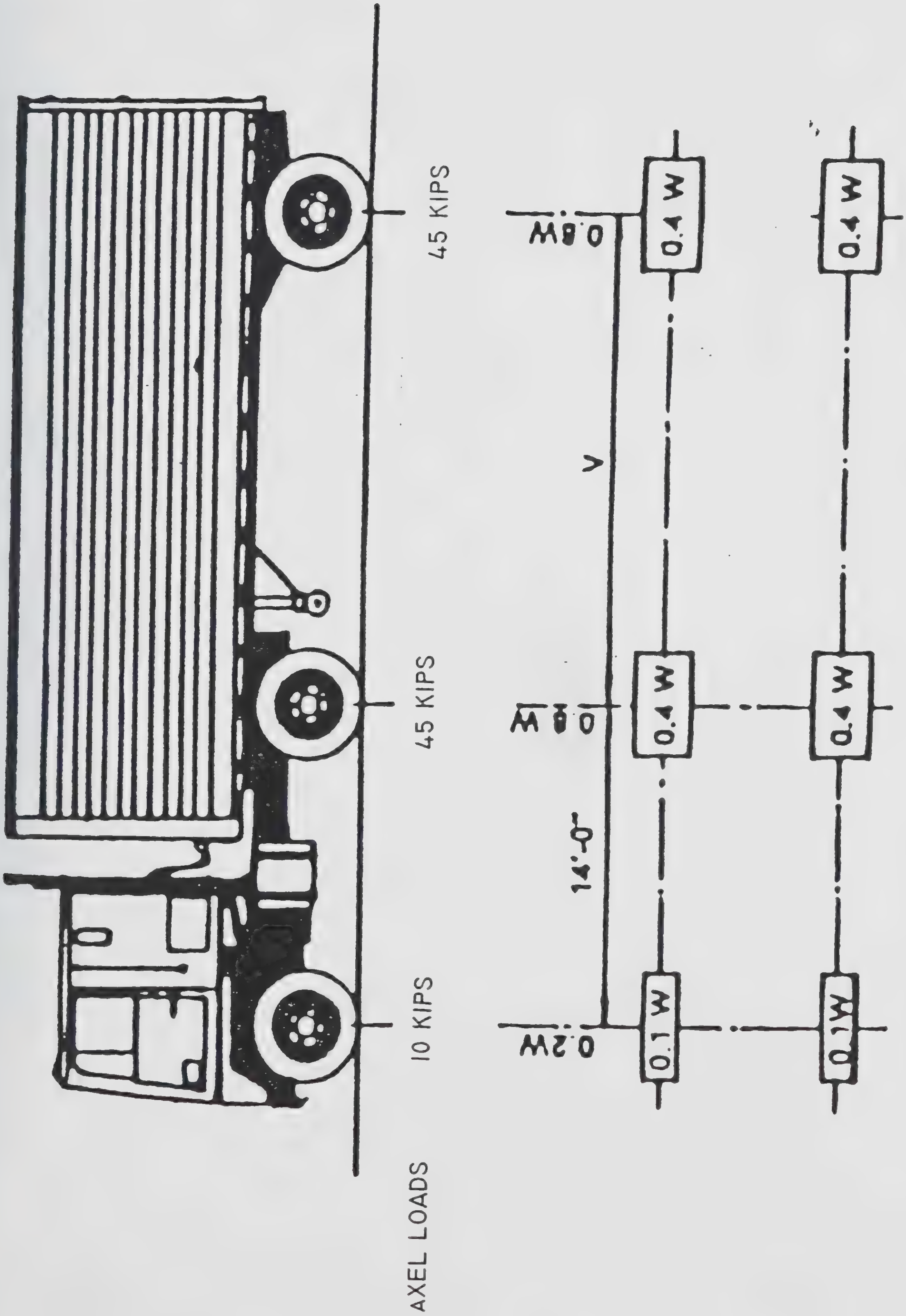
Computations

Project: MUDDY RIVER　　Project # 06967
Location: BOSTON　　Sheet　　of
Calculated by: BFB　　Date:
Checked by:　　Date:
Title WARD'S POND - ELEVATION



PPENDIX C – BRIDGE RATINGS

TYPICAL TRAILOR DUMP TRUCK



SIGN:

BOYLSTON STREET (BOYLSTON STREET OVER MUDDY RIVER, B-16-188)

STANTS

$\text{kip} := 1000 \cdot \text{lb}$ $\quad \text{psi} := \dfrac{\text{lb}}{\text{in}^2}$ $\quad \text{ksi} := \dfrac{\text{kip}}{\text{in}^2}$ $\quad \text{pcf} := \dfrac{\text{lb}}{\text{ft}^3}$ $\quad \text{klf} := \dfrac{\text{kip}}{\text{ft}}$

$\text{ksf} := \dfrac{\text{kip}}{\text{ft}^2}$ $\quad \text{psf} := \dfrac{\text{lb}}{\text{ft}^2}$ $\quad \text{ton} := 2 \cdot \text{kip}$

ITS:

$\gamma_1 := 150 \cdot \dfrac{\text{lb}}{\text{ft}^3}$ ROADWAY MATERIAL

$\gamma_2 := 120 \cdot \dfrac{\text{lb}}{\text{ft}^3}$ SOIL

$P_{41} := 18.5 \cdot \text{kip}$

TRUCK LIVE LOAD, POINT LOADS

$P_{50} := 22.5 \cdot \text{kip}$

$\text{depth}_{\text{soil}} := 0 \cdot \text{ft}$ SOIL DEPTH AT TOP OF ARCH

$\text{depth}_{\text{road}} := 8 \cdot \text{in}$ DEPTH OF ROADWAY MATERIAL

RCH INFORMATION

$\text{arch}_{\text{sw}} := 375 \cdot \dfrac{\text{lb}}{\text{ft}}$ APPROXIMATE ARCH SELFWEIGHT

$L := 60 \cdot \text{ft}$ ARCH SPAN

$d := 36 \cdot \text{in}$

$t := 12 \cdot \text{in}$ PRINCIPLE ARCH DIMENSIONS

$f := 22 \cdot \text{ft}$

$\dfrac{f}{L} = 0.367$

$k := 1.7878$ FROM TABLE E-1, BRICK & TILE ENGINEERING (BTE)

$\alpha := 5.2605$

$\beta := 2.3151$

$\gamma := 7.1199$ FROM TABLE E-4, BTE

$\delta := 2.1406$

COMPUTATIONS:

LOADINGS

$roadway := depth_{road} \cdot \gamma_1 \cdot t$ $roadway = 100 \frac{lb}{ft}$

$soil\_load := depth_{soil} \cdot \gamma_2 \cdot t$ $soil\_load = 0 \frac{lb}{ft}$

$\omega_{total} := roadway + soil\_load + arch_{sw}$ $\omega_{total} = 0.475 \frac{kip}{ft}$

$w_u := \omega_{total} \cdot L$ TOTAL UNIFORM LOAD $w_u = 28.5\ kip$

$P_p := f \cdot \gamma_2 \cdot t$ $P_p = 2.64 \times 10^3 \frac{lb}{ft}$

$w_p := \frac{P_p \cdot L}{3}$ COMPLEMENTARY PARABOLIC LOAD $w_p = 52.8\ kip$

$S_u := 0.8900$

$T_u := 0.5788$ FROM TABLE E-3, BTE - UNIFORM LOADING

SOLVING FOR: J, θ, F, K UNIFORM LOADING

$J_u := 1 + \frac{\delta}{\gamma}$ $J_u = 1.301$

$\theta_u := 2 \cdot (\alpha + \beta)$ $\theta_u = 15.151$

$F_u := \theta_u - \gamma \cdot J_u^2$ $F_u = 3.107$

$K_u := \frac{S_u \cdot \theta_u}{\gamma}$ $K_u = 1.894$

$S_p := 0.5171$

$T_p := 0.3563$

FROM TABLE E-3, BTE - PARABOLIC LOADING

LVING FOR: J, θ, F, K PARABOLIC LOADING

$J_p := 1 + \frac{\delta}{\gamma}$ $\quad J_p = 1.301$

$\theta_p := 2\cdot(\alpha + \beta)$ $\quad \theta_p = 15.151$

$F_p := \theta_p - \gamma\cdot J_p^{\,2}$ $\quad F_p = 3.107$

$K_p := \frac{S_p\cdot\theta_p}{\gamma}$ $\quad K_p = 1.1$

LVING FOR: MOMENT, AXIAL, SHEAR

$$\phi := \begin{pmatrix} 55.4260 \\ 49.3050 \\ 41.1658 \\ 30.3122 \\ 16.3475 \\ 0 \end{pmatrix}\cdot\frac{\pi}{180} \qquad \phi = \begin{pmatrix} 0.967 \\ 0.861 \\ 0.718 \\ 0.529 \\ 0.285 \\ 0 \end{pmatrix}$$

UNIFORM LOADING

$H_{u1} := \frac{w_u\cdot L}{F_u\cdot f}\cdot(K_u - 2\cdot J_u\cdot T_u)$ $\quad H_{u1} = 9.715\,\text{kip}$

$V_{u1} := \frac{w_u}{2}$ $\quad V_{u1} = 14.25\,\text{kip}$

INVESTIGATION AT TENTH POINTS

$x := 0\cdot L$

$$N_{ux0} := H_{u1}\cdot\cos(\phi_{0,0}) + \left(\frac{w_u}{2}\right)\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin(\phi_{0,0}) \qquad N_{ux0} = 17.247\,\text{kip}$$

$x := 0.1\cdot L$

$$N_{ux1} := H_{u1}\cdot\cos(\phi_{1,0}) + \left(\frac{w_u}{2}\right)\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin(\phi_{1,0}) \qquad N_{ux1} = 14.978\,\text{kip}$$

$x := 0.2\cdot L$

$$N_{ux2} := H_{u1}\cdot\cos(\phi_{2,0}) + \left(\frac{w_u}{2}\right)\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin(\phi_{2,0}) \qquad N_{ux2} = 12.942\,\text{kip}$$

$x := 0.3 \cdot L$

$$N_{ux3} := H_{u1} \cdot \cos(\phi_{3,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{3,0}) \qquad N_{ux3} = 11.264\,\text{kip}$$

$x := 0.4 \cdot L$

$$N_{ux4} := H_{u1} \cdot \cos(\phi_{4,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{4,0}) \qquad N_{ux4} = 10.125\,\text{kip}$$

$x := 0.5 \cdot L$

$$N_{ux5} := H_{u1} \cdot \cos(\phi_{5,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{5,0}) \qquad N_{ux5} = 9.715\,\text{kip}$$

$$N_{ux} := \begin{pmatrix} N_{ux0} \\ N_{ux1} \\ N_{ux2} \\ N_{ux3} \\ N_{ux4} \\ N_{ux5} \end{pmatrix} \qquad N_{ux} = \begin{pmatrix} 17.247 \\ 14.978 \\ 12.942 \\ 11.264 \\ 10.125 \\ 9.715 \end{pmatrix} \text{kip}$$

PARAPOLIC LOADING

$$M_{p1} := \frac{w_p \cdot L}{F_p} \cdot (J_p \cdot S_p - 2 \cdot T_p) \qquad M_{p1} = -40.826\,\text{ft} \cdot \text{kip}$$

$$H_{p1} := \frac{w_p \cdot L}{F_p \cdot f} \cdot (K_p - 2 \cdot J_p \cdot T_p) \qquad H_{p1} = 8.045\,\text{kip}$$

$$V_{p1} := \frac{w_p}{2} \qquad V_{p1} = 26.4\,\text{kip}$$

INVESTIGATION AT TENTH POINTS

$x := 0 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L} \qquad y = 0\,\text{ft}$$

$$M_{px0} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px0} = -40.826\,\text{ft} \cdot \text{kip}$$

$$N_{px0} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{0,0}) + H_{p1} \cdot \cos(\phi_{0,0}) \qquad N_{px0} = 26.303\,\text{kip}$$

$$Q_{px0} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{0,0}) - H_{p1} \cdot \sin(\phi_{0,0}) \qquad Q_{px0} = 8.357\,\text{kip}$$

$x := 0.1 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px1} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px1} = 12.359\,\text{ft} \cdot \text{kip}$$

$$N_{px1} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{1,0}) + H_{p1} \cdot \cos(\phi_{1,0}) \qquad N_{px1} = 15.494\,\text{kip}$$

$$Q_{px1} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{1,0}) - H_{p1} \cdot \sin(\phi_{1,0}) \qquad Q_{px1} = 2.714\,\text{kip}$$

$x := 0.2 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px2} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px2} = 18.244\,\text{ft} \cdot \text{kip}$$

$$N_{px2} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{2,0}) + H_{p1} \cdot \cos(\phi_{2,0}) \qquad N_{px2} = 9.81\,\text{kip}$$

$$Q_{px2} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{2,0}) - H_{p1} \cdot \sin(\phi_{2,0}) \qquad Q_{px2} = -1.003\,\text{kip}$$

$x := 0.3 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px3} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px3} = 3.439\,\text{ft} \cdot \text{kip}$$

$$N_{px3} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{3,0}) + H_{p1} \cdot \cos(\phi_{3,0}) \qquad N_{px3} = 7.798\,\text{kip}$$

$$Q_{px3} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{3,0}) - H_{p1} \cdot \sin(\phi_{3,0}) \qquad Q_{px3} = -2.602\,\text{kip}$$

$x := 0.4 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px4} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px4} = -13.047\,\text{ft} \cdot \text{kip}$$

$$N_{px4} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{4,0}) + H_{p1} \cdot \cos(\phi_{4,0}) \qquad N_{px4} = 7.779\,\text{kip}$$

$$Q_{px4} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{4,0}) - H_{p1} \cdot \sin(\phi_{4,0}) \qquad Q_{px4} = -2.062\,\text{kip}$$

$x := 0.5 \cdot L$

$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$

$M_{px5} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y$ $\qquad M_{px5} = -19.809\,\text{ft} \cdot \text{kip}$

$N_{px5} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{5,0}) + H_{p1} \cdot \cos(\phi_{5,0})$ $\qquad N_{px5} = 8.045\,\text{kip}$

$Q_{px5} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{5,0}) - H_{p1} \cdot \sin(\phi_{5,0})$ $\qquad Q_{px5} = 0\,\text{kip}$

$$M_{px} := \begin{pmatrix} M_{px0} \\ M_{px1} \\ M_{px2} \\ M_{px3} \\ M_{px4} \\ M_{px5} \end{pmatrix} \qquad N_{px} := \begin{pmatrix} N_{px0} \\ N_{px1} \\ N_{px2} \\ N_{px3} \\ N_{px4} \\ N_{px5} \end{pmatrix} \qquad Q_{px} := \begin{pmatrix} Q_{px0} \\ Q_{px1} \\ Q_{px2} \\ Q_{px3} \\ Q_{px4} \\ Q_{px5} \end{pmatrix}$$

$$M_{px} = \begin{pmatrix} -40.826 \\ 12.359 \\ 18.244 \\ 3.439 \\ -13.047 \\ -19.809 \end{pmatrix} \text{ft} \cdot \text{kip} \qquad N_{px} = \begin{pmatrix} 26.303 \\ 15.494 \\ 9.81 \\ 7.798 \\ 7.779 \\ 8.045 \end{pmatrix} \text{kip} \qquad Q_{px} = \begin{pmatrix} 8.357 \\ 2.714 \\ -1.003 \\ -2.602 \\ -2.062 \\ 0 \end{pmatrix} \text{kip}$$

COMPRESSIVE AND SHEAR STRESS CALCULATIONS

$$f_{mmax} := \frac{N_{ux} + N_{px}}{t \cdot d} + \frac{6 \cdot M_{px}}{t \cdot d^2} \qquad f_{mmin} := \frac{N_{ux} + N_{px}}{t \cdot d} - \frac{6 \cdot M_{px}}{t \cdot d^2}$$

$$f_{mmax} = \begin{pmatrix} -88.2 \\ 127.755 \\ 137.128 \\ 60.046 \\ -18.958 \\ -50.599 \end{pmatrix} \text{psi} \qquad f_{mmin} = \begin{pmatrix} 289.817 \\ 13.318 \\ -31.797 \\ 28.202 \\ 101.846 \\ 132.821 \end{pmatrix} \text{psi}$$

$$v_m := \frac{Q_{px}}{t \cdot d} \qquad v_m = \begin{pmatrix} 19.345 \\ 6.282 \\ -2.321 \\ -6.022 \\ -4.772 \\ 0 \end{pmatrix} \text{psi}$$

IVE LOAD CHECK

FOR 41 TON TRUCK

$$H_{12} := \frac{2 \cdot P_{41} \cdot L}{F_u \cdot f} \cdot (K_u - 2 \cdot J_u \cdot T_u) \qquad H_{12} = 12.613\,\text{kip}$$

INFLUENCE OF 2 AXLES

$x := 0 \cdot L$

$$N_{12x0} := H_{12} \cdot \cos(\phi_{0,0}) + \frac{2 \cdot P_{41}}{2} \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{0,0}) \qquad N_{12x0} = 22.39\,\text{kip}$$

$$f_{mmaxTL} := \frac{N_{12x0} + N_{ux} + N_{px}}{t \cdot d} + \frac{6 \cdot M_{px}}{t \cdot d^2} \qquad f_{mminTL} := \frac{N_{12x0} + N_{ux} + N_{px}}{t \cdot d} - \frac{6 \cdot M_{px}}{t \cdot d^2}$$

$$f_{mmaxTL_{0,0}} = -36.371\,\text{psi} \qquad f_{mminTL_{0,0}} = 341.647\,\text{psi}$$

FOR 50 TON TRUCK

$$H_{16} := \frac{2 \cdot P_{50} \cdot L}{F_u \cdot f} \cdot (K_u - 2 \cdot J_u \cdot T_u) \qquad H_{16} = 15.34\,\text{kip}$$

INFLUENCE OF 2 AXLES

$x := 0 \cdot L$

$$N_{16x0} := H_{12} \cdot \cos(\phi_{0,0}) + \frac{2 \cdot P_{50}}{2} \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{0,0}) \qquad N_{16x0} = 25.684\,\text{kip}$$

$$f_{mmaxTL} := \frac{N_{16x0} + N_{ux} + N_{px}}{t \cdot d} + \frac{6 \cdot M_{px}}{t \cdot d^2} \qquad f_{mminTL} := \frac{N_{16x0} + N_{ux} + N_{px}}{t \cdot d} - \frac{6 \cdot M_{px}}{t \cdot d^2}$$

$$f_{mmaxTL_{0,0}} = -28.747\,\text{psi} \qquad f_{mminTL_{0,0}} = 349.271\,\text{psi}$$

ALLOWABLE INVENTORY COMPRESSIVE STRESS
SOLID MASONRY BRICK (8000 PSI)
W/ TYPE M MORTAR $f_c = 350$ PSI > 349 OK ✓

(REF: AASHTO MANUAL FOR CONDITION EVALUATION
OF BRIDGES 1994 - TABLE 6.6.2.6)

Project: MUDDY RIVER
Project # 06967
Location: BOSTON
Sheet of
Calculated by: BFB
Date: 6-27-00
Checked by:
Date:
Title BOYLSTON ST. - SHEAR CHECK

TIRE CONTACT AREA (SEE JAMAICAWAY EXIT CALC'S):

PERIMETER = 66"

DEPTH = 36"

PUNCHING SHEAR AREA = 36" × 66" = 2376 IN^2

$$v_{LL} = \frac{P}{A} = \frac{22.5^{k}}{2376\ IN^2} = 9.5\ PSI$$

$$\underline{+\ 19.5\ PSI}\quad FROM\ DL$$

$$29\ PSI$$

ALLOWABLE SHEAR ACI 318-95 A.3.1

$$v_c = 1.1 \times \sqrt{f'_c} = 1.1 \cdot \sqrt{4000} = 69.6\ PSI$$

69.6 PSI > 29 PSI ✓ OK

GN:

AGASSIZ STREET (AGASSIZ STREET OVER MUDDY RIVER, B-16-189)
6'-0" RADIUS (12'-0" SPAN)

TANTS

$kip := 1000 \cdot lb$ $\quad psi := \frac{lb}{in^2}$ $\quad ksi := \frac{kip}{in^2}$ $\quad pcf := \frac{lb}{ft^3}$ $\quad klf := \frac{kip}{ft}$

$ksf := \frac{kip}{ft^2}$ $\quad psf := \frac{lb}{ft^2}$ $\quad ton := 2 \cdot kip$

S:

$\gamma_1 := 150 \cdot \frac{lb}{ft^3}$ ROADWAY MATERIAL

$\gamma_2 := 120 \cdot \frac{lb}{ft^3}$ SOIL

$P_{41} := 18.5 \cdot kip$

TRUCK LIVE LOAD, POINT LOADS

$P_{50} := 22.5 \cdot kip$

$depth_{soil} := 3 \cdot ft$ SOIL DEPTH AT TOP OF ARCH

$depth_{road} := 4 \cdot in$ DEPTH OF ROADWAY MATERIAL

CH INFORMATION

$arch_{sw} := 188 \cdot \frac{lb}{ft}$ APPROXIMATE ARCH SELFWEIGHT

$L := 12 \cdot ft$ ARCH SPAN

$d := 18 \cdot in$

$t := 12 \cdot in$ PRINCIPLE ARCH DIMENSIONS

$f := 6 \cdot ft$

$\frac{f}{L} = 0.5$

$k := 2.40$ FROM TABLE E-1, BRICK & TILE ENGINEERING (BTE)

$\alpha := 6.24$

$\beta := 2.56$

$\gamma := 7.680$ FROM TABLE E-4, BTE

$\delta := 2.560$

COMPUTATIONS:

LOADINGS

$roadway := depth_{road} \cdot \gamma_1 \cdot t$ $\qquad roadway = 50 \frac{lb}{ft}$

$soil\_load := depth_{soil} \cdot \gamma_2 \cdot t$ $\qquad soil\_load = 360 \frac{lb}{ft}$

$\omega_{total} := roadway + soil\_load + arch_{sw}$ $\qquad \omega_{total} = 0.598 \frac{kip}{ft}$

$w_u := \omega_{total} \cdot L$ TOTAL UNIFORM LOAD $\qquad w_u = 7.176\,kip$

$P_p := f \cdot \gamma_2 \cdot t$ $\qquad P_p = 720 \frac{lb}{ft}$

$w_p := \frac{P_p \cdot L}{3}$ COMPLEMENTARY PARABOLIC LOAD $\qquad w_p = 2.88\,kip$

$S_u := 0.9602$

$T_u := 0.6400$ FROM TABLE E-3, BTE - UNIFORM LOADING

SOLVING FOR: J, θ, F, K UNIFORM LOADING

$J_u := 1 + \frac{\delta}{\gamma}$ $\qquad J_u = 1.333$

$\theta_u := 2 \cdot (\alpha + \beta)$ $\qquad \theta_u = 17.6$

$F_u := \theta_u - \gamma \cdot J_u^{\,2}$ $\qquad F_u = 3.947$

$K_u := \frac{S_u \cdot \theta_u}{\gamma}$ $\qquad K_u = 2.2$

$S_p := 0.5638$

$T_p := 0.4000$

FROM TABLE E-3, BTE - PARABOLIC LOADING

LVING FOR: J, θ, F, K PARABOLIC LOADING

$J_p := 1 + \frac{\delta}{\gamma}$ $\quad J_p = 1.333$

$\theta_p := 2\cdot(\alpha + \beta)$ $\quad \theta_p = 17.6$

$F_p := \theta_p - \gamma\cdot J_p^{\,2}$ $\quad F_p = 3.947$

$K_p := \frac{S_p\cdot\theta_p}{\gamma}$ $\quad K_p = 1.292$

LVING FOR: MOMENT, AXIAL, SHEAR

$$\phi := \begin{pmatrix} 63.4333 \\ 58.0000 \\ 50.2000 \\ 38.6667 \\ 21.8000 \\ 0 \end{pmatrix}\cdot\frac{\pi}{180} \qquad \phi = \begin{pmatrix} 1.107 \\ 1.012 \\ 0.876 \\ 0.675 \\ 0.38 \\ 0 \end{pmatrix}$$

FROM TABLE E-2, BTE

UNIFORM LOADING

$H_{u1} := \frac{w_u\cdot L}{F_u\cdot f}\cdot(K_u - 2\cdot J_u\cdot T_u)$ $\quad H_{u1} = 1.796\,\text{kip}$

$V_{u1} := \frac{w_u}{2}$ $\quad V_{u1} = 3.588\,\text{kip}$

INVESTIGATION AT TENTH POINTS

$x := 0\cdot L$

$$N_{ux0} := H_{u1}\cdot\cos(\phi_{0,0}) + \left(\frac{w_u}{2}\right)\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin(\phi_{0,0}) \qquad N_{ux0} = 4.012\,\text{kip}$$

$x := 0.1\cdot L$

$$N_{ux1} := H_{u1}\cdot\cos(\phi_{1,0}) + \left(\frac{w_u}{2}\right)\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin(\phi_{1,0}) \qquad N_{ux1} = 3.386\,\text{kip}$$

$x := 0.2\cdot L$

$$N_{ux2} := H_{u1}\cdot\cos(\phi_{2,0}) + \left(\frac{w_u}{2}\right)\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin(\phi_{2,0}) \qquad N_{ux2} = 2.803\,\text{kip}$$

$x := 0.3 \cdot L$

$$N_{ux3} := H_{u1} \cdot \cos(\phi_{3,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{3,0}) \qquad N_{ux3} = 2.299\,\text{kip}$$

$x := 0.4 \cdot L$

$$N_{ux4} := H_{u1} \cdot \cos(\phi_{4,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{4,0}) \qquad N_{ux4} = 1.934\,\text{kip}$$

$x := 0.5 \cdot L$

$$N_{ux5} := H_{u1} \cdot \cos(\phi_{5,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{5,0}) \qquad N_{ux5} = 1.796\,\text{kip}$$

$$N_{ux} := \begin{pmatrix} N_{ux0} \\ N_{ux1} \\ N_{ux2} \\ N_{ux3} \\ N_{ux4} \\ N_{ux5} \end{pmatrix} \qquad N_{ux} = \begin{pmatrix} 4.012 \\ 3.386 \\ 2.803 \\ 2.299 \\ 1.934 \\ 1.796 \end{pmatrix} \text{kip}$$

PARAPOLIC LOADING

$$M_{p1} := \frac{w_p \cdot L}{F_p} \cdot (J_p \cdot S_p - 2 \cdot T_p) \qquad M_{p1} = -0.423\,\text{ft} \cdot \text{kip}$$

$$H_{p1} := \frac{w_p \cdot L}{F_p \cdot f} \cdot (K_p - 2 \cdot J_p \cdot T_p) \qquad H_{p1} = 0.329\,\text{kip}$$

$$V_{p1} := \frac{w_p}{2} \qquad V_{p1} = 1.44\,\text{kip}$$

INVESTIGATION AT TENTH POINTS

$x := 0 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L} \qquad y = 0\,\text{ft}$$

$$M_{px0} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px0} = -0.423\,\text{ft} \cdot \text{kip}$$

$$N_{px0} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{0,0}) + H_{p1} \cdot \cos(\phi_{0,0}) \qquad N_{px0} = 1.435\,\text{kip}$$

$$Q_{px0} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{0,0}) - H_{p1} \cdot \sin(\phi_{0,0}) \qquad Q_{px0} = 0.35\,\text{kip}$$

$x := 0.1 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px1} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y$$

$M_{px1} = 0.142\,\text{ft} \cdot \text{kip}$

$$N_{px1} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{1,0}) + H_{p1} \cdot \cos(\phi_{1,0})$$

$N_{px1} = 0.8\,\text{kip}$

$$Q_{px1} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{1,0}) - H_{p1} \cdot \sin(\phi_{1,0})$$

$Q_{px1} = 0.112\,\text{kip}$

$x := 0.2 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px2} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y$$

$M_{px2} = 0.194\,\text{ft} \cdot \text{kip}$

$$N_{px2} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{2,0}) + H_{p1} \cdot \cos(\phi_{2,0})$$

$N_{px2} = 0.45\,\text{kip}$

$$Q_{px2} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{2,0}) - H_{p1} \cdot \sin(\phi_{2,0})$$

$Q_{px2} = -0.054\,\text{kip}$

$x := 0.3 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px3} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y$$

$M_{px3} = 0.024\,\text{ft} \cdot \text{kip}$

$$N_{px3} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{3,0}) + H_{p1} \cdot \cos(\phi_{3,0})$$

$N_{px3} = 0.314\,\text{kip}$

$$Q_{px3} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{3,0}) - H_{p1} \cdot \sin(\phi_{3,0})$$

$Q_{px3} = -0.134\,\text{kip}$

$x := 0.4 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px4} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y$$

$M_{px4} = -0.161\,\text{ft} \cdot \text{kip}$

$$N_{px4} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{4,0}) + H_{p1} \cdot \cos(\phi_{4,0})$$

$N_{px4} = 0.31\,\text{kip}$

$$Q_{px4} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{4,0}) - H_{p1} \cdot \sin(\phi_{4,0})$$

$Q_{px4} = -0.111\,\text{kip}$

$$x := 0.5 \cdot L$$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px5} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px5} = -0.236\,\text{ft} \cdot \text{kip}$$

$$N_{px5} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{5,0}) + H_{p1} \cdot \cos(\phi_{5,0}) \qquad N_{px5} = 0.329\,\text{kip}$$

$$Q_{px5} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{5,0}) - H_{p1} \cdot \sin(\phi_{5,0}) \qquad Q_{px5} = 0\,\text{kip}$$

$$M_{px} := \begin{pmatrix} M_{px0} \\ M_{px1} \\ M_{px2} \\ M_{px3} \\ M_{px4} \\ M_{px5} \end{pmatrix} \qquad N_{px} := \begin{pmatrix} N_{px0} \\ N_{px1} \\ N_{px2} \\ N_{px3} \\ N_{px4} \\ N_{px5} \end{pmatrix} \qquad Q_{px} := \begin{pmatrix} Q_{px0} \\ Q_{px1} \\ Q_{px2} \\ Q_{px3} \\ Q_{px4} \\ Q_{px5} \end{pmatrix}$$

$$M_{px} = \begin{pmatrix} -0.423 \\ 0.142 \\ 0.194 \\ 0.024 \\ -0.161 \\ -0.236 \end{pmatrix} \text{ft} \cdot \text{kip} \qquad N_{px} = \begin{pmatrix} 1.435 \\ 0.8 \\ 0.45 \\ 0.314 \\ 0.31 \\ 0.329 \end{pmatrix} \text{kip} \qquad Q_{px} = \begin{pmatrix} 0.35 \\ 0.112 \\ -0.054 \\ -0.134 \\ -0.111 \\ 0 \end{pmatrix} \text{kip}$$

COMPRESSIVE AND SHEAR STRESS CALCULATIONS

$$f_{mmax} := \frac{N_{ux} + N_{px}}{t \cdot d} + \frac{6 \cdot M_{px}}{t \cdot d^2} \qquad f_{mmin} := \frac{N_{ux} + N_{px}}{t \cdot d} - \frac{6 \cdot M_{px}}{t \cdot d^2}$$

$$f_{mmax} = \begin{pmatrix} 17.392 \\ 22.009 \\ 18.658 \\ 12.547 \\ 7.41 \\ 5.462 \end{pmatrix} \text{psi} \qquad f_{mmin} = \begin{pmatrix} 33.046 \\ 16.745 \\ 11.461 \\ 11.649 \\ 13.363 \\ 14.21 \end{pmatrix} \text{psi}$$

$$v_m := \frac{Q_{px}}{t \cdot d} \qquad v_m = \begin{pmatrix} 1.62 \\ 0.517 \\ -0.248 \\ -0.618 \\ -0.516 \\ 0 \end{pmatrix} \text{psi}$$

VE LOAD CHECK

FOR 41 TON TRUCK

$$H_{12} := \frac{2 \cdot P_{41} \cdot L}{F_u \cdot f} \cdot \left(K_u - 2 \cdot J_u \cdot T_u\right) \qquad H_{12} = 9.259\,\text{kip}$$

INFLUENCE OF 1 AXLE

$x := 0 \cdot L$

$$N_{12x0} := H_{12} \cdot \cos\left(\phi_{0,0}\right) + \frac{2 \cdot P_{41}}{2} \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin\left(\phi_{0,0}\right) \qquad N_{12x0} = 20.687\,\text{kip}$$

$$f_{mmaxTL} := \frac{N_{12x0} + N_{ux} + N_{px}}{t \cdot d} + \frac{6 \cdot M_{px}}{t \cdot d^2} \qquad f_{mminTL} := \frac{N_{12x0} + N_{ux} + N_{px}}{t \cdot d} - \frac{6 \cdot M_{px}}{t \cdot d^2}$$

$$f_{mmaxTL_{0,0}} = 113.167\,\text{psi} \qquad f_{mminTL_{0,0}} = 128.821\,\text{psi}$$

FOR 50 TON TRUCK

$$H_{16} := \frac{2 \cdot P_{50} \cdot L}{F_u \cdot f} \cdot \left(K_u - 2 \cdot J_u \cdot T_u\right) \qquad H_{16} = 11.26\,\text{kip}$$

INFLUENCE OF 1 AXLE

$x := 0 \cdot L$

$$N_{16x0} := H_{12} \cdot \cos\left(\phi_{0,0}\right) + \frac{2 \cdot P_{50}}{2} \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin\left(\phi_{0,0}\right) \qquad N_{16x0} = 24.265\,\text{kip}$$

$$f_{mmaxTL} := \frac{N_{16x0} + N_{ux} + N_{px}}{t \cdot d} + \frac{6 \cdot M_{px}}{t \cdot d^2} \qquad f_{mminTL} := \frac{N_{16x0} + N_{ux} + N_{px}}{t \cdot d} - \frac{6 \cdot M_{px}}{t \cdot d^2}$$

$$f_{mmaxTL_{0,0}} = 129.731\,\text{psi} \qquad f_{mminTL_{0,0}} = 145.385\,\text{psi}$$

ALLOWABLE STRESS (SEE BOYLSTON ST. CALC'S) ✓

$f_c = 350$ PSI > 145 PSI OK

Vanasse Hangen Brustlin, Inc.

PROJECT: MUDDY RIVER
LOCATION: BOSTON
DESIGN: BFB DATE: 6/27/00
CHECK:______ DATE:______

GN:

AGASSIZ STREET (AGASSIZ STREET OVER MUDDY RIVER, B-16-189)
5'-3" RADIUS (10'-6" SPAN)

TANTS

$kip := 1000 \cdot lb$ $psi := \frac{lb}{in^2}$ $ksi := \frac{kip}{in^2}$ $pcf := \frac{lb}{ft^3}$ $klf := \frac{kip}{ft}$

$ksf := \frac{kip}{ft^2}$ $psf := \frac{lb}{ft^2}$ $ton := 2 \cdot kip$

S:

$\gamma_1 := 150 \cdot \frac{lb}{ft^3}$ ROADWAY MATERIAL

$\gamma_2 := 120 \cdot \frac{lb}{ft^3}$ SOIL

$P_{41} := 18.5 \cdot kip$

TRUCK LIVE LOAD, POINT LOADS

$P_{50} := 22.5 \cdot kip$

$depth_{soil} := 5 \cdot ft$ SOIL DEPTH AT TOP OF ARCH

$depth_{road} := 4 \cdot in$ DEPTH OF ROADWAY MATERIAL

CH INFORMATION

$arch_{sw} := 125 \cdot \frac{lb}{ft}$ APPROXIMATE ARCH SELFWEIGHT

$L := 12 \cdot ft$ ARCH SPAN

$d := 12 \cdot in$

$t := 12 \cdot in$ PRINCIPLE ARCH DIMENSIONS

$f := 6 \cdot ft$

$\frac{f}{L} = 0.5$

$k := 2.40$ FROM TABLE E-1, BRICK & TILE ENGINEERING (BTE)

$\alpha := 6.24$

$\beta := 2.56$

$\gamma := 7.680$ FROM TABLE E-4, BTE

$\delta := 2.560$

COMPUTATIONS:

LOADINGS

$roadway := depth_{road} \cdot \gamma_1 \cdot t$ $roadway = 50 \frac{lb}{ft}$

$soil\_load := depth_{soil} \cdot \gamma_2 \cdot t$ $soil\_load = 600 \frac{lb}{ft}$

$\omega_{total} := roadway + soil\_load + arch_{sw}$ $\omega_{total} = 0.775 \frac{kip}{ft}$

$w_u := \omega_{total} \cdot L$ TOTAL UNIFORM LOAD $w_u = 9.3\,kip$

$P_p := f \cdot \gamma_2 \cdot t$ $P_p = 720 \frac{lb}{ft}$

$w_p := \frac{P_p \cdot L}{3}$ COMPLEMENTARY PARABOLIC LOAD $w_p = 2.88\,kip$

$S_u := 0.9602$

$T_u := 0.6400$ FROM TABLE E-3, BTE - UNIFORM LOADING

SOLVING FOR: J, θ, F, K UNIFORM LOADING

$J_u := 1 + \frac{\delta}{\gamma}$ $J_u = 1.333$

$\theta_u := 2 \cdot (\alpha + \beta)$ $\theta_u = 17.6$

$F_u := \theta_u - \gamma \cdot J_u^2$ $F_u = 3.947$

$K_u := \frac{S_u \cdot \theta_u}{\gamma}$ $K_u = 2.2$

$S_p := 0.5638$

$T_p := 0.4000$

FROM TABLE E-3, BTE - PARABOLIC LOADING

LVING FOR: J, θ, F, K PARABOLIC LOADING

$J_p := 1 + \frac{\delta}{\gamma}$ $\quad J_p = 1.333$

$\theta_p := 2\cdot(\alpha + \beta)$ $\quad \theta_p = 17.6$

$F_p := \theta_p - \gamma\cdot J_p^{\,2}$ $\quad F_p = 3.947$

$K_p := \frac{S_p\cdot\theta_p}{\gamma}$ $\quad K_p = 1.292$

LVING FOR: MOMENT, AXIAL, SHEAR

$$\phi := \begin{pmatrix} 63.4333 \\ 58.0000 \\ 50.2000 \\ 38.6667 \\ 21.8000 \\ 0 \end{pmatrix}\cdot\frac{\pi}{180} \qquad \phi = \begin{pmatrix} 1.107 \\ 1.012 \\ 0.876 \\ 0.675 \\ 0.38 \\ 0 \end{pmatrix}$$

FROM TABLE E-2, BTE

UNIFORM LOADING

$H_{u1} := \frac{w_u\cdot L}{F_u\cdot f}\cdot(K_u - 2\cdot J_u\cdot T_u)$ $\quad H_{u1} = 2.327\,\text{kip}$

$V_{u1} := \frac{w_u}{2}$ $\quad V_{u1} = 4.65\,\text{kip}$

INVESTIGATION AT TENTH POINTS

$x := 0\cdot L$

$N_{ux0} := H_{u1}\cdot\cos(\phi_{0,0}) + \left(\frac{w_u}{2}\right)\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin(\phi_{0,0})$ $\quad N_{ux0} = 5.2\,\text{kip}$

$x := 0.1\cdot L$

$N_{ux1} := H_{u1}\cdot\cos(\phi_{1,0}) + \left(\frac{w_u}{2}\right)\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin(\phi_{1,0})$ $\quad N_{ux1} = 4.388\,\text{kip}$

$x := 0.2\cdot L$

$N_{ux2} := H_{u1}\cdot\cos(\phi_{2,0}) + \left(\frac{w_u}{2}\right)\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin(\phi_{2,0})$ $\quad N_{ux2} = 3.633\,\text{kip}$

$x := 0.3 \cdot L$

$$N_{ux3} := H_{u1} \cdot \cos(\phi_{3,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{3,0}) \qquad N_{ux3} = 2.979\,\text{kip}$$

$x := 0.4 \cdot L$

$$N_{ux4} := H_{u1} \cdot \cos(\phi_{4,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{4,0}) \qquad N_{ux4} = 2.506\,\text{kip}$$

$x := 0.5 \cdot L$

$$N_{ux5} := H_{u1} \cdot \cos(\phi_{5,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{5,0}) \qquad N_{ux5} = 2.327\,\text{kip}$$

$$N_{ux} := \begin{pmatrix} N_{ux0} \\ N_{ux1} \\ N_{ux2} \\ N_{ux3} \\ N_{ux4} \\ N_{ux5} \end{pmatrix} \qquad N_{ux} = \begin{pmatrix} 5.2 \\ 4.388 \\ 3.633 \\ 2.979 \\ 2.506 \\ 2.327 \end{pmatrix} \text{kip}$$

PARAPOLIC LOADING

$$M_{p1} := \frac{w_p \cdot L}{F_p} \cdot (J_p \cdot S_p - 2 \cdot T_p) \qquad M_{p1} = -0.423\,\text{ft} \cdot \text{kip}$$

$$H_{p1} := \frac{w_p \cdot L}{F_p \cdot f} \cdot (K_p - 2 \cdot J_p \cdot T_p) \qquad H_{p1} = 0.329\,\text{kip}$$

$$V_{p1} := \frac{w_p}{2} \qquad V_{p1} = 1.44\,\text{kip}$$

INVESTIGATION AT TENTH POINTS

$x := 0 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L} \qquad y = 0\,\text{ft}$$

$$M_{px0} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px0} = -0.423\,\text{ft} \cdot \text{kip}$$

$$N_{px0} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{0,0}) + H_{p1} \cdot \cos(\phi_{0,0}) \qquad N_{px0} = 1.435\,\text{kip}$$

$$Q_{px0} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{0,0}) - H_{p1} \cdot \sin(\phi_{0,0}) \qquad Q_{px0} = 0.35\,\text{kip}$$

$x := 0.1 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px1} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px1} = 0.142\,\text{ft} \cdot \text{kip}$$

$$N_{px1} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{1,0}) + H_{p1} \cdot \cos(\phi_{1,0}) \qquad N_{px1} = 0.8\,\text{kip}$$

$$Q_{px1} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{1,0}) - H_{p1} \cdot \sin(\phi_{1,0}) \qquad Q_{px1} = 0.112\,\text{kip}$$

$x := 0.2 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px2} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px2} = 0.194\,\text{ft} \cdot \text{kip}$$

$$N_{px2} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{2,0}) + H_{p1} \cdot \cos(\phi_{2,0}) \qquad N_{px2} = 0.45\,\text{kip}$$

$$Q_{px2} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{2,0}) - H_{p1} \cdot \sin(\phi_{2,0}) \qquad Q_{px2} = -0.054\,\text{kip}$$

$x := 0.3 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px3} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px3} = 0.024\,\text{ft} \cdot \text{kip}$$

$$N_{px3} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{3,0}) + H_{p1} \cdot \cos(\phi_{3,0}) \qquad N_{px3} = 0.314\,\text{kip}$$

$$Q_{px3} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{3,0}) - H_{p1} \cdot \sin(\phi_{3,0}) \qquad Q_{px3} = -0.134\,\text{kip}$$

$x := 0.4 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px4} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px4} = -0.161\,\text{ft} \cdot \text{kip}$$

$$N_{px4} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{4,0}) + H_{p1} \cdot \cos(\phi_{4,0}) \qquad N_{px4} = 0.31\,\text{kip}$$

$$Q_{px4} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{4,0}) - H_{p1} \cdot \sin(\phi_{4,0}) \qquad Q_{px4} = -0.111\,\text{kip}$$

$x := 0.5 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px5} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px5} = -0.236\,\text{ft} \cdot \text{kip}$$

$$N_{px5} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{5,0}) + H_{p1} \cdot \cos(\phi_{5,0}) \qquad N_{px5} = 0.329\,\text{kip}$$

$$Q_{px5} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{5,0}) - H_{p1} \cdot \sin(\phi_{5,0}) \qquad Q_{px5} = 0\,\text{kip}$$

$$M_{px} := \begin{pmatrix} M_{px0} \\ M_{px1} \\ M_{px2} \\ M_{px3} \\ M_{px4} \\ M_{px5} \end{pmatrix} \qquad N_{px} := \begin{pmatrix} N_{px0} \\ N_{px1} \\ N_{px2} \\ N_{px3} \\ N_{px4} \\ N_{px5} \end{pmatrix} \qquad Q_{px} := \begin{pmatrix} Q_{px0} \\ Q_{px1} \\ Q_{px2} \\ Q_{px3} \\ Q_{px4} \\ Q_{px5} \end{pmatrix}$$

$$M_{px} = \begin{pmatrix} -0.423 \\ 0.142 \\ 0.194 \\ 0.024 \\ -0.161 \\ -0.236 \end{pmatrix} \text{ft} \cdot \text{kip} \qquad N_{px} = \begin{pmatrix} 1.435 \\ 0.8 \\ 0.45 \\ 0.314 \\ 0.31 \\ 0.329 \end{pmatrix} \text{kip} \qquad Q_{px} = \begin{pmatrix} 0.35 \\ 0.112 \\ -0.054 \\ -0.134 \\ -0.111 \\ 0 \end{pmatrix} \text{kip}$$

COMPRESSIVE AND SHEAR STRESS CALCULATIONS

$$f_{mmax} := \frac{N_{ux} + N_{px}}{t \cdot d} + \frac{6 \cdot M_{px}}{t \cdot d^2} \qquad f_{mmin} := \frac{N_{ux} + N_{px}}{t \cdot d} - \frac{6 \cdot M_{px}}{t \cdot d^2}$$

$$f_{mmax} = \begin{pmatrix} 28.465 \\ 41.946 \\ 36.449 \\ 23.883 \\ 12.857 \\ 8.603 \end{pmatrix} \text{psi} \qquad f_{mmin} = \begin{pmatrix} 63.686 \\ 30.102 \\ 20.255 \\ 21.861 \\ 26.251 \\ 28.287 \end{pmatrix} \text{psi}$$

$$v_m := \frac{Q_{px}}{t \cdot d} \qquad v_m = \begin{pmatrix} 2.429 \\ 0.776 \\ -0.372 \\ -0.927 \\ -0.774 \\ 0 \end{pmatrix} \text{psi}$$

IVE LOAD CHECK

FOR 41 TON TRUCK

$$H_{12} := \frac{2 \cdot P_{41} \cdot L}{F_u \cdot f} \cdot (K_u - 2 \cdot J_u \cdot T_u) \qquad H_{12} = 9.259\,\text{kip}$$

INFLUENCE OF 1 AXLE

$x := 0 \cdot L$

$$N_{12x0} := H_{12} \cdot \cos(\phi_{0,0}) + \frac{2 \cdot P_{41}}{2} \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{0,0}) \qquad N_{12x0} = 20.687\,\text{kip}$$

$$f_{mmaxTL} := \frac{N_{12x0} + N_{ux} + N_{px}}{t \cdot d} + \frac{6 \cdot M_{px}}{t \cdot d^2} \qquad f_{mminTL} := \frac{N_{12x0} + N_{ux} + N_{px}}{t \cdot d} - \frac{6 \cdot M_{px}}{t \cdot d^2}$$

$$f_{mmaxTL_{0,0}} = 172.128\,\text{psi} \qquad f_{mminTL_{0,0}} = 207.349\,\text{psi}$$

FOR 50 TON TRUCK

$$H_{16} := \frac{2 \cdot P_{50} \cdot L}{F_u \cdot f} \cdot (K_u - 2 \cdot J_u \cdot T_u) \qquad H_{16} = 11.26\,\text{kip}$$

INFLUENCE OF 1 AXLE

$x := 0 \cdot L$

$$N_{16x0} := H_{12} \cdot \cos(\phi_{0,0}) + \frac{2 \cdot P_{50}}{2} \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{0,0}) \qquad N_{16x0} = 24.265\,\text{kip}$$

$$f_{mmaxTL} := \frac{N_{16x0} + N_{ux} + N_{px}}{t \cdot d} + \frac{6 \cdot M_{px}}{t \cdot d^2} \qquad f_{mminTL} := \frac{N_{16x0} + N_{ux} + N_{px}}{t \cdot d} - \frac{6 \cdot M_{px}}{t \cdot d^2}$$

$$f_{mmaxTL_{0,0}} = 196.973\,\text{psi} \qquad f_{mminTL_{0,0}} = 232.194\,\text{psi}$$

ALLOWABLE STRESS (SEE BOYLSTON ST. CALC'S)

f_c = 350 PSI > 232 PSI OK ✓

GN:

AGASSIZ STREET (AGASSIZ STREET OVER MUDDY RIVER, B-16-189)
4'-6" RADIUS (9' SPAN)

TANTS

$kip := 1000 \cdot lb$ $psi := \dfrac{lb}{in^2}$ $ksi := \dfrac{kip}{in^2}$ $pcf := \dfrac{lb}{ft^3}$ $klf := \dfrac{kip}{ft}$

$ksf := \dfrac{kip}{ft^2}$ $psf := \dfrac{lb}{ft^2}$ $ton := 2 \cdot kip$

S:

$\gamma_1 := 150 \cdot \dfrac{lb}{ft^3}$ ROADWAY MATERIAL

$\gamma_2 := 120 \cdot \dfrac{lb}{ft^3}$ SOIL

$P_{41} := 18.5 \cdot kip$

TRUCK LIVE LOAD, POINT LOADS

$P_{50} := 22.5 \cdot kip$

$depth_{soil} := 6 \cdot ft$ SOIL DEPTH AT TOP OF ARCH

$depth_{road} := 4 \cdot in$ DEPTH OF ROADWAY MATERIAL

CH INFORMATION

$arch_{sw} := 125 \cdot \dfrac{lb}{ft}$ APPROXIMATE ARCH SELFWEIGHT

$L := 12 \cdot ft$ ARCH SPAN

$d := 12 \cdot in$

$t := 12 \cdot in$ PRINCIPLE ARCH DIMENSIONS

$f := 6 \cdot ft$

$\dfrac{f}{L} = 0.5$

$k := 2.40$ FROM TABLE E-1, BRICK & TILE ENGINEERING (BTE)

$\alpha := 6.24$

$\beta := 2.56$

$\gamma := 7.680$ FROM TABLE E-4, BTE

$\delta := 2.560$

COMPUTATIONS:

LOADINGS

$\text{roadway} := \text{depth}_{\text{road}} \cdot \gamma_1 \cdot t$ $\text{roadway} = 50 \dfrac{\text{lb}}{\text{ft}}$

$\text{soil\_load} := \text{depth}_{\text{soil}} \cdot \gamma_2 \cdot t$ $\text{soil\_load} = 720 \dfrac{\text{lb}}{\text{ft}}$

$\omega_{\text{total}} := \text{roadway} + \text{soil\_load} + \text{arch}_{\text{sw}}$ $\omega_{\text{total}} = 0.895 \dfrac{\text{kip}}{\text{ft}}$

$w_u := \omega_{\text{total}} \cdot L$ TOTAL UNIFORM LOAD $w_u = 10.74\,\text{kip}$

$P_p := f \cdot \gamma_2 \cdot t$ $P_p = 720 \dfrac{\text{lb}}{\text{ft}}$

$w_p := \dfrac{P_p \cdot L}{3}$ COMPLEMENTARY PARABOLIC LOAD $w_p = 2.88\,\text{kip}$

$S_u := 0.9602$ FROM TABLE E-3, BTE - UNIFORM LOADING

$T_u := 0.6400$

SOLVING FOR: J, θ, F, K UNIFORM LOADING

$J_u := 1 + \dfrac{\delta}{\gamma}$ $J_u = 1.333$

$\theta_u := 2 \cdot (\alpha + \beta)$ $\theta_u = 17.6$

$F_u := \theta_u - \gamma \cdot J_u^{\,2}$ $F_u = 3.947$

$K_u := \dfrac{S_u \cdot \theta_u}{\gamma}$ $K_u = 2.2$

$S_p := 0.5638$ FROM TABLE E-3, BTE - PARABOLIC LOADING

$T_p := 0.4000$

LVING FOR: J, θ, F, K PARABOLIC LOADING

$J_p := 1 + \frac{\delta}{\gamma}$ $J_p = 1.333$

$\theta_p := 2\cdot(\alpha + \beta)$ $\theta_p = 17.6$

$F_p := \theta_p - \gamma\cdot J_p^{\,2}$ $F_p = 3.947$

$K_p := \frac{S_p\cdot\theta_p}{\gamma}$ $K_p = 1.292$

LVING FOR: MOMENT, AXIAL, SHEAR

$$\phi := \begin{pmatrix} 63.4333 \\ 58.0000 \\ 50.2000 \\ 38.6667 \\ 21.8000 \\ 0 \end{pmatrix}\cdot\frac{\pi}{180} \qquad \phi = \begin{pmatrix} 1.107 \\ 1.012 \\ 0.876 \\ 0.675 \\ 0.38 \\ 0 \end{pmatrix}$$

FROM TABLE E-2, BTE

UNIFORM LOADING

$H_{u1} := \frac{w_u\cdot L}{F_u\cdot f}\cdot(K_u - 2\cdot J_u\cdot T_u)$ $H_{u1} = 2.687\,\text{kip}$

$V_{u1} := \frac{w_u}{2}$ $V_{u1} = 5.37\,\text{kip}$

INVESTIGATION AT TENTH POINTS

$x := 0\cdot L$

$N_{ux0} := H_{u1}\cdot\cos(\phi_{0,0}) + \left(\frac{w_u}{2}\right)\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin(\phi_{0,0})$ $N_{ux0} = 6.005\,\text{kip}$

$x := 0.1\cdot L$

$N_{ux1} := H_{u1}\cdot\cos(\phi_{1,0}) + \left(\frac{w_u}{2}\right)\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin(\phi_{1,0})$ $N_{ux1} = 5.067\,\text{kip}$

$x := 0.2\cdot L$

$N_{ux2} := H_{u1}\cdot\cos(\phi_{2,0}) + \left(\frac{w_u}{2}\right)\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin(\phi_{2,0})$ $N_{ux2} = 4.196\,\text{kip}$

$x := 0.3 \cdot L$

$$N_{ux3} := H_{u1} \cdot \cos(\phi_{3,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{3,0}) \qquad N_{ux3} = 3.44\,\text{kip}$$

$x := 0.4 \cdot L$

$$N_{ux4} := H_{u1} \cdot \cos(\phi_{4,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{4,0}) \qquad N_{ux4} = 2.894\,\text{kip}$$

$x := 0.5 \cdot L$

$$N_{ux5} := H_{u1} \cdot \cos(\phi_{5,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{5,0}) \qquad N_{ux5} = 2.687\,\text{kip}$$

$$N_{ux} := \begin{pmatrix} N_{ux0} \\ N_{ux1} \\ N_{ux2} \\ N_{ux3} \\ N_{ux4} \\ N_{ux5} \end{pmatrix} \qquad N_{ux} = \begin{pmatrix} 6.005 \\ 5.067 \\ 4.196 \\ 3.44 \\ 2.894 \\ 2.687 \end{pmatrix} \text{kip}$$

PARAPOLIC LOADING

$$M_{p1} := \frac{w_p \cdot L}{F_p} \cdot (J_p \cdot S_p - 2 \cdot T_p) \qquad M_{p1} = -0.423\,\text{ft} \cdot \text{kip}$$

$$H_{p1} := \frac{w_p \cdot L}{F_p \cdot f} \cdot (K_p - 2 \cdot J_p \cdot T_p) \qquad H_{p1} = 0.329\,\text{kip}$$

$$V_{p1} := \frac{w_p}{2} \qquad V_{p1} = 1.44\,\text{kip}$$

INVESTIGATION AT TENTH POINTS

$x := 0 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L} \qquad y = 0\,\text{ft}$$

$$M_{px0} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px0} = -0.423\,\text{ft} \cdot \text{kip}$$

$$N_{px0} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{0,0}) + H_{p1} \cdot \cos(\phi_{0,0}) \qquad N_{px0} = 1.435\,\text{kip}$$

$$Q_{px0} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{0,0}) - H_{p1} \cdot \sin(\phi_{0,0}) \qquad Q_{px0} = 0.35\,\text{kip}$$

$x := 0.1 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px1} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px1} = 0.142\,\text{ft}\cdot\text{kip}$$

$$N_{px1} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin\left(\phi_{1,0}\right) + H_{p1} \cdot \cos\left(\phi_{1,0}\right) \qquad N_{px1} = 0.8\,\text{kip}$$

$$Q_{px1} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos\left(\phi_{1,0}\right) - H_{p1} \cdot \sin\left(\phi_{1,0}\right) \qquad Q_{px1} = 0.112\,\text{kip}$$

$x := 0.2 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px2} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px2} = 0.194\,\text{ft}\cdot\text{kip}$$

$$N_{px2} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin\left(\phi_{2,0}\right) + H_{p1} \cdot \cos\left(\phi_{2,0}\right) \qquad N_{px2} = 0.45\,\text{kip}$$

$$Q_{px2} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos\left(\phi_{2,0}\right) - H_{p1} \cdot \sin\left(\phi_{2,0}\right) \qquad Q_{px2} = -0.054\,\text{kip}$$

$x := 0.3 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px3} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px3} = 0.024\,\text{ft}\cdot\text{kip}$$

$$N_{px3} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin\left(\phi_{3,0}\right) + H_{p1} \cdot \cos\left(\phi_{3,0}\right) \qquad N_{px3} = 0.314\,\text{kip}$$

$$Q_{px3} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos\left(\phi_{3,0}\right) - H_{p1} \cdot \sin\left(\phi_{3,0}\right) \qquad Q_{px3} = -0.134\,\text{kip}$$

$x := 0.4 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px4} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px4} = -0.161\,\text{ft}\cdot\text{kip}$$

$$N_{px4} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin\left(\phi_{4,0}\right) + H_{p1} \cdot \cos\left(\phi_{4,0}\right) \qquad N_{px4} = 0.31\,\text{kip}$$

$$Q_{px4} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos\left(\phi_{4,0}\right) - H_{p1} \cdot \sin\left(\phi_{4,0}\right) \qquad Q_{px4} = -0.111\,\text{kip}$$

$$x := 0.5 \cdot L$$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px5} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px5} = -0.236\,\text{ft}\cdot\text{kip}$$

$$N_{px5} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{5,0}) + H_{p1} \cdot \cos(\phi_{5,0}) \qquad N_{px5} = 0.329\,\text{kip}$$

$$Q_{px5} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{5,0}) - H_{p1} \cdot \sin(\phi_{5,0}) \qquad Q_{px5} = 0\,\text{kip}$$

$$M_{px} := \begin{pmatrix} M_{px0} \\ M_{px1} \\ M_{px2} \\ M_{px3} \\ M_{px4} \\ M_{px5} \end{pmatrix} \qquad N_{px} := \begin{pmatrix} N_{px0} \\ N_{px1} \\ N_{px2} \\ N_{px3} \\ N_{px4} \\ N_{px5} \end{pmatrix} \qquad Q_{px} := \begin{pmatrix} Q_{px0} \\ Q_{px1} \\ Q_{px2} \\ Q_{px3} \\ Q_{px4} \\ Q_{px5} \end{pmatrix}$$

$$M_{px} = \begin{pmatrix} -0.423 \\ 0.142 \\ 0.194 \\ 0.024 \\ -0.161 \\ -0.236 \end{pmatrix} \text{ft}\cdot\text{kip} \qquad N_{px} = \begin{pmatrix} 1.435 \\ 0.8 \\ 0.45 \\ 0.314 \\ 0.31 \\ 0.329 \end{pmatrix} \text{kip} \qquad Q_{px} = \begin{pmatrix} 0.35 \\ 0.112 \\ -0.054 \\ -0.134 \\ -0.111 \\ 0 \end{pmatrix} \text{kip}$$

COMPRESSIVE AND SHEAR STRESS CALCULATIONS

$$f_{mmax} := \frac{N_{ux} + N_{px}}{t \cdot d} + \frac{6 \cdot M_{px}}{t \cdot d^2} \qquad f_{mmin} := \frac{N_{ux} + N_{px}}{t \cdot d} - \frac{6 \cdot M_{px}}{t \cdot d^2}$$

$$f_{mmax} = \begin{pmatrix} 34.056 \\ 46.664 \\ 40.356 \\ 27.086 \\ 15.552 \\ 11.105 \end{pmatrix} \text{psi} \qquad f_{mmin} = \begin{pmatrix} 69.278 \\ 34.821 \\ 24.161 \\ 25.064 \\ 28.946 \\ 30.79 \end{pmatrix} \text{psi}$$

$$v_m := \frac{Q_{px}}{t \cdot d} \qquad v_m = \begin{pmatrix} 2.429 \\ 0.776 \\ -0.372 \\ -0.927 \\ -0.774 \\ 0 \end{pmatrix} \text{psi}$$

VE LOAD CHECK

FOR 41 TON TRUCK

$$H_{12} := \frac{2\cdot P_{41}\cdot L}{F_u\cdot f}\cdot\left(K_u - 2\cdot J_u\cdot T_u\right)$$ $H_{12} = 9.259\,\text{kip}$ INFLUENCE OF 1 AXLE

$x := 0\cdot L$

$$N_{12x0} := H_{12}\cdot\cos\left(\phi_{0,0}\right) + \frac{2\cdot P_{41}}{2}\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin\left(\phi_{0,0}\right)$$ $N_{12x0} = 20.687\,\text{kip}$

$$f_{mmaxTL} := \frac{N_{12x0} + N_{ux} + N_{px}}{t\cdot d} + \frac{6\cdot M_{px}}{t\cdot d^2}$$ $$f_{mminTL} := \frac{N_{12x0} + N_{ux} + N_{px}}{t\cdot d} - \frac{6\cdot M_{px}}{t\cdot d^2}$$

${f_{mmaxTL}}_{0,0} = 177.719\,\text{psi}$ ${f_{mminTL}}_{0,0} = 212.941\,\text{psi}$

FOR 50 TON TRUCK

$$H_{16} := \frac{2\cdot P_{50}\cdot L}{F_u\cdot f}\cdot\left(K_u - 2\cdot J_u\cdot T_u\right)$$ $H_{16} = 11.26\,\text{kip}$ INFLUENCE OF 1 AXLE

$x := 0\cdot L$

$$N_{16x0} := H_{12}\cdot\cos\left(\phi_{0,0}\right) + \frac{2\cdot P_{50}}{2}\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin\left(\phi_{0,0}\right)$$ $N_{16x0} = 24.265\,\text{kip}$

$$f_{mmaxTL} := \frac{N_{16x0} + N_{ux} + N_{px}}{t\cdot d} + \frac{6\cdot M_{px}}{t\cdot d^2}$$ $$f_{mminTL} := \frac{N_{16x0} + N_{ux} + N_{px}}{t\cdot d} - \frac{6\cdot M_{px}}{t\cdot d^2}$$

${f_{mmaxTL}}_{0,0} = 202.564\,\text{psi}$ ${f_{mminTL}}_{0,0} = 237.785\,\text{psi}$

ALLOWABLE STRESS (SEE BOYLSTON ST. CALC'S)

f_c = 350 PSI > 238 PSI ✓ OK

GN:

NETHERLANDS ROAD (BELLEVUE STREET OVER MUDDY RIVER, B-16-193)

TANTS

$kip := 1000 \cdot lb$ $psi := \frac{lb}{in^2}$ $ksi := \frac{kip}{in^2}$ $pcf := \frac{lb}{ft^3}$ $klf := \frac{kip}{ft}$

$ksf := \frac{kip}{ft^2}$ $psf := \frac{lb}{ft^2}$ $ton := 2 \cdot kip$

S:

$\gamma_1 := 150 \cdot \frac{lb}{ft^3}$ ROADWAY MATERIAL

$\gamma_2 := 120 \cdot \frac{lb}{ft^3}$ SOIL

$P_{41} := 18.5 \cdot kip$

TRUCK LIVE LOAD, POINT LOADS

$P_{50} := 22.5 \cdot kip$

$depth_{soil} := 6 \cdot ft$ SOIL DEPTH AT TOP OF ARCH

$depth_{road} := 10 \cdot in$ DEPTH OF ROADWAY MATERIAL

CH INFORMATION

$arch_{sw} := 125 \cdot \frac{lb}{ft}$ APPROXIMATE ARCH SELFWEIGHT

$L := 30 \cdot ft$ ARCH SPAN

$d := 20 \cdot in$

$t := 12 \cdot in$ PRINCIPLE ARCH DIMENSIONS

$f := 6 \cdot ft$

$\frac{f}{L} = 0.2$

$k := 1.28$ FROM TABLE E-1, BRICK & TILE ENGINEERING (BTE)

$\alpha := 4.32$

$\beta := 2.08$

$\gamma := 6.583$ FROM TABLE E-4, BTE

$\delta := 1.737$

COMPUTATIONS:

LOADINGS

$roadway := depth_{road} \cdot \gamma_1 \cdot t$ $roadway = 125 \frac{lb}{ft}$

$soil\_load := depth_{soil} \cdot \gamma_2 \cdot t$ $soil\_load = 720 \frac{lb}{ft}$

$\omega_{total} := roadway + soil\_load + arch_{sw}$ $\omega_{total} = 0.97 \frac{kip}{ft}$

$w_u := \omega_{total} \cdot L$ TOTAL UNIFORM LOAD $w_u = 29.1\ kip$

$P_p := f \cdot \gamma_2 \cdot t$ $P_p = 720 \frac{lb}{ft}$

$w_p := \frac{P_p \cdot L}{3}$ COMPLEMENTARY PARABOLIC LOAD $w_p = 7.2\ kip$

$S_u := 0.8229$

$T_u := 0.5200$

FROM TABLE E-3, BTE - UNIFORM LOADING

SOLVING FOR: J, θ, F, K UNIFORM LOADING

$J_u := 1 + \frac{\delta}{\gamma}$ $J_u = 1.264$

$\theta_u := 2 \cdot (\alpha + \beta)$ $\theta_u = 12.8$

$F_u := \theta_u - \gamma \cdot J_u^2$ $F_u = 2.285$

$K_u := \frac{S_u \cdot \theta_u}{\gamma}$ $K_u = 1.6$

$S_p := 0.4724$ FROM TABLE E-3, BTE - PARABOLIC LOADING

$T_p := 0.3143$

VING FOR: J, θ, F, K PARABOLIC LOADING

$_p := 1 + \frac{\delta}{\gamma}$ $J_p = 1.264$

$_p := 2 \cdot (\alpha + \beta)$ $\theta_p = 12.8$

$_p := \theta_p - \gamma \cdot J_p^{\,2}$ $F_p = 2.285$

$_p := \frac{S_p \cdot \theta_p}{\gamma}$ $K_p = 0.919$

VING FOR: MOMENT, AXIAL, SHEAR

$$\phi := \begin{pmatrix} 38.6667 \\ 32.6167 \\ 25.6333 \\ 17.7500 \\ 9.0833 \\ 0 \end{pmatrix} \cdot \frac{\pi}{180} \qquad \phi = \begin{pmatrix} 0.675 \\ 0.569 \\ 0.447 \\ 0.31 \\ 0.159 \\ 0 \end{pmatrix}$$

FROM TABLE E-2, BTE

UNIFORM LOADING

$H_{u1} := \frac{w_u \cdot L}{F_u \cdot f} \cdot (K_u - 2 \cdot J_u \cdot T_u)$ $H_{u1} = 18.191\,\text{kip}$

$V_{u1} := \frac{w_u}{2}$ $V_{u1} = 14.55\,\text{kip}$

INVESTIGATION AT TENTH POINTS

$x := 0 \cdot L$

$N_{ux0} := H_{u1} \cdot \cos(\phi_{0,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{0,0})$ $N_{ux0} = 23.294\,\text{kip}$

$x := 0.1 \cdot L$

$N_{ux1} := H_{u1} \cdot \cos(\phi_{1,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{1,0})$ $N_{ux1} = 21.596\,\text{kip}$

$x := 0.2 \cdot L$

$N_{ux2} := H_{u1} \cdot \cos(\phi_{2,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{2,0})$ $N_{ux2} = 20.177\,\text{kip}$

$x := 0.3 \cdot L$

$$N_{ux3} := H_{u1} \cdot \cos(\phi_{3,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{3,0}) \qquad N_{ux3} = 19.099\,\text{kip}$$

$x := 0.4 \cdot L$

$$N_{ux4} := H_{u1} \cdot \cos(\phi_{4,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{4,0}) \qquad N_{ux4} = 18.422\,\text{kip}$$

$x := 0.5 \cdot L$

$$N_{ux5} := H_{u1} \cdot \cos(\phi_{5,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{5,0}) \qquad N_{ux5} = 18.191\,\text{kip}$$

$$N_{ux} := \begin{pmatrix} N_{ux0} \\ N_{ux1} \\ N_{ux2} \\ N_{ux3} \\ N_{ux4} \\ N_{ux5} \end{pmatrix} \qquad N_{ux} = \begin{pmatrix} 23.294 \\ 21.596 \\ 20.177 \\ 19.099 \\ 18.422 \\ 18.191 \end{pmatrix} \text{kip}$$

PARAPOLIC LOADING

$$M_{p1} := \frac{w_p \cdot L}{F_p} \cdot (J_p \cdot S_p - 2 \cdot T_p) \qquad M_{p1} = -2.983\,\text{ft} \cdot \text{kip}$$

$$H_{p1} := \frac{w_p \cdot L}{F_p \cdot f} \cdot (K_p - 2 \cdot J_p \cdot T_p) \qquad H_{p1} = 1.955\,\text{kip}$$

$$V_{p1} := \frac{w_p}{2} \qquad V_{p1} = 3.6\,\text{kip}$$

INVESTIGATION AT TENTH POINTS

$x := 0 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L} \qquad y = 0\,\text{ft}$$

$$M_{px0} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px0} = -2.983\,\text{ft} \cdot \text{kip}$$

$$N_{px0} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{0,0}) + H_{p1} \cdot \cos(\phi_{0,0}) \qquad N_{px0} = 3.776\,\text{kip}$$

$$Q_{px0} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{0,0}) - H_{p1} \cdot \sin(\phi_{0,0}) \qquad Q_{px0} = 1.589\,\text{kip}$$

$x := 0.1 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px1} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px1} = 0.765 \, ft \cdot kip$$

$$N_{px1} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{1,0}) + H_{p1} \cdot \cos(\phi_{1,0}) \qquad N_{px1} = 2.64 \, kip$$

$$Q_{px1} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{1,0}) - H_{p1} \cdot \sin(\phi_{1,0}) \qquad Q_{px1} = 0.499 \, kip$$

$x := 0.2 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px2} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px2} = 1.26 \, ft \cdot kip$$

$$N_{px2} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{2,0}) + H_{p1} \cdot \cos(\phi_{2,0}) \qquad N_{px2} = 2.099 \, kip$$

$$Q_{px2} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{2,0}) - H_{p1} \cdot \sin(\phi_{2,0}) \qquad Q_{px2} = -0.145 \, kip$$

$x := 0.3 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px3} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px3} = 0.318 \, ft \cdot kip$$

$$N_{px3} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{3,0}) + H_{p1} \cdot \cos(\phi_{3,0}) \qquad N_{px3} = 1.932 \, kip$$

$$Q_{px3} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{3,0}) - H_{p1} \cdot \sin(\phi_{3,0}) \qquad Q_{px3} = -0.377 \, kip$$

$x := 0.4 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px4} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px4} = -0.766 \, ft \cdot kip$$

$$N_{px4} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{4,0}) + H_{p1} \cdot \cos(\phi_{4,0}) \qquad N_{px4} = 1.935 \, kip$$

$$Q_{px4} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{4,0}) - H_{p1} \cdot \sin(\phi_{4,0}) \qquad Q_{px4} = -0.28 \, kip$$

$$x := 0.5 \cdot L$$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px5} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px5} = -1.213\,\text{ft} \cdot \text{kip}$$

$$N_{px5} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin\left(\phi_{5,0}\right) + H_{p1} \cdot \cos\left(\phi_{5,0}\right) \qquad N_{px5} = 1.955\,\text{kip}$$

$$Q_{px5} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos\left(\phi_{5,0}\right) - H_{p1} \cdot \sin\left(\phi_{5,0}\right) \qquad Q_{px5} = 0\,\text{kip}$$

$$M_{px} := \begin{pmatrix} M_{px0} \\ M_{px1} \\ M_{px2} \\ M_{px3} \\ M_{px4} \\ M_{px5} \end{pmatrix} \qquad N_{px} := \begin{pmatrix} N_{px0} \\ N_{px1} \\ N_{px2} \\ N_{px3} \\ N_{px4} \\ N_{px5} \end{pmatrix} \qquad Q_{px} := \begin{pmatrix} Q_{px0} \\ Q_{px1} \\ Q_{px2} \\ Q_{px3} \\ Q_{px4} \\ Q_{px5} \end{pmatrix}$$

$$M_{px} = \begin{pmatrix} -2.983 \\ 0.765 \\ 1.26 \\ 0.318 \\ -0.766 \\ -1.213 \end{pmatrix} \text{ft} \cdot \text{kip} \qquad N_{px} = \begin{pmatrix} 3.776 \\ 2.64 \\ 2.099 \\ 1.932 \\ 1.935 \\ 1.955 \end{pmatrix} \text{kip} \qquad Q_{px} = \begin{pmatrix} 1.589 \\ 0.499 \\ -0.145 \\ -0.377 \\ -0.28 \\ 0 \end{pmatrix} \text{kip}$$

COMPRESSIVE AND SHEAR STRESS CALCULATIONS

$$f_{mmax} := \frac{N_{ux} + N_{px}}{t \cdot d} + \frac{6 \cdot M_{px}}{t \cdot d^2} \qquad f_{mmin} := \frac{N_{ux} + N_{px}}{t \cdot d} - \frac{6 \cdot M_{px}}{t \cdot d^2}$$

$$f_{mmax} = \begin{pmatrix} 68.044 \\ 112.452 \\ 111.718 \\ 92.4 \\ 73.337 \\ 65.742 \end{pmatrix} \text{psi} \qquad f_{mmin} = \begin{pmatrix} 157.535 \\ 89.516 \\ 73.916 \\ 82.859 \\ 96.304 \\ 102.138 \end{pmatrix} \text{psi}$$

$$v_m := \frac{Q_{px}}{t \cdot d} \qquad v_m = \begin{pmatrix} 6.622 \\ 2.078 \\ -0.603 \\ -1.569 \\ -1.168 \\ 0 \end{pmatrix} \text{psi}$$

VE LOAD CHECK

FOR 41 TON TRUCK

$$H_{12} := \frac{2\cdot P_{41}\cdot L}{F_u\cdot f}\cdot\left(K_u - 2\cdot J_u\cdot T_u\right) \qquad H_{12} = 23.129\,\text{kip}$$

INFLUENCE OF 1 AXLE

$$x := 0\cdot L$$

$$N_{12x0} := H_{12}\cdot\cos\left(\phi_{0,0}\right) + \frac{2\cdot P_{41}}{2}\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin\left(\phi_{0,0}\right) \qquad N_{12x0} = 29.618\,\text{kip}$$

$$f_{mmaxTL} := \frac{N_{12x0} + N_{ux} + N_{px}}{t\cdot d} + \frac{6\cdot M_{px}}{t\cdot d^2} \qquad f_{mminTL} := \frac{N_{12x0} + N_{ux} + N_{px}}{t\cdot d} - \frac{6\cdot M_{px}}{t\cdot d^2}$$

$$f_{mmaxTL_{0,0}} = 191.451\,\text{psi} \qquad f_{mminTL_{0,0}} = 280.941\,\text{psi}$$

FOR 50 TON TRUCK

$$H_{16} := \frac{2\cdot P_{50}\cdot L}{F_u\cdot f}\cdot\left(K_u - 2\cdot J_u\cdot T_u\right) \qquad H_{16} = 28.13\,\text{kip}$$

INFLUENCE OF 1 AXLE

$$x := 0\cdot L$$

$$N_{16x0} := H_{12}\cdot\cos\left(\phi_{0,0}\right) + \frac{2\cdot P_{50}}{2}\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin\left(\phi_{0,0}\right) \qquad N_{16x0} = 32.117\,\text{kip}$$

$$f_{mmaxTL} := \frac{N_{16x0} + N_{ux} + N_{px}}{t\cdot d} + \frac{6\cdot M_{px}}{t\cdot d^2} \qquad f_{mminTL} := \frac{N_{16x0} + N_{ux} + N_{px}}{t\cdot d} - \frac{6\cdot M_{px}}{t\cdot d^2}$$

$$f_{mmaxTL_{0,0}} = 201.864\,\text{psi} \qquad f_{mminTL_{0,0}} = 291.354\,\text{psi}$$

ALLOWABLE COMPRESSIVE STRESS (SEE BOYLSTON ST. CALC'S)

f_c = 350 PSI > 291 PSI ✓ OK

GN

JAMAICAWAY EXIT (RIVERWAY-JAMAICAWAY OVER MUDDY RIVER, B-27-12)

TANTS

$kip := 1000 \cdot lb$ $psi := \frac{lb}{in^2}$ $ksi := \frac{kip}{in^2}$ $pcf := \frac{lb}{ft^3}$ $klf := \frac{kip}{ft}$

$ksf := \frac{kip}{ft^2}$ $psf := \frac{lb}{ft^2}$ $ton := 2 \cdot kip$

S:

$\gamma_1 := 150 \cdot \frac{lb}{ft^3}$ ROADWAY MATERIAL

$\gamma_2 := 120 \cdot \frac{lb}{ft^3}$ SOIL

$P_{41} := 18.5 \cdot kip$

TRUCK LIVE LOAD, POINT LOADS

$P_{50} := 22.5 \cdot kip$

$depth_{soil} := 0 \cdot ft$ SOIL DEPTH AT TOP OF ARCH

$depth_{road} := 8 \cdot in$ DEPTH OF ROADWAY MATERIAL

CH INFORMATION

$arch_{sw} := 105 \cdot \frac{lb}{ft}$ APPROXIMATE ARCH SELFWEIGHT

$L := 15 \cdot ft$ ARCH SPAN

$d := 10 \cdot in$

$t := 12 \cdot in$ PRINCIPLE ARCH DIMENSIONS

$f := 7.5 \cdot ft$

$\frac{f}{L} = 0.5$

$k := 2.40$ FROM TABLE E-1, BRICK & TILE ENGINEERING (BTE)

$\alpha := 6.24$

$\beta := 2.56$

$\gamma := 7.680$ FROM TABLE E-4, BTE

$\delta := 2.560$

COMPUTATIONS:

LOADINGS

$roadway := depth_{road} \cdot \gamma_1 \cdot t$ $roadway = 100 \dfrac{lb}{ft}$

$soil\_load := depth_{soil} \cdot \gamma_2 \cdot t$ $soil\_load = 0 \dfrac{lb}{ft}$

$\omega_{total} := roadway + soil\_load + arch_{sw}$ $\omega_{total} = 0.205 \dfrac{kip}{ft}$

$w_u := \omega_{total} \cdot L$ TOTAL UNIFORM LOAD $w_u = 3.075\,kip$

$P_p := f \cdot \gamma_2 \cdot t$ $P_p = 900 \dfrac{lb}{ft}$

$w_p := \dfrac{P_p \cdot L}{3}$ COMPLEMENTARY PARABOLIC LOAD $w_p = 4.5\,kip$

$S_u := 0.9602$

$T_u := 0.6400$ FROM TABLE E-3, BTE - UNIFORM LOADING

SOLVING FOR: J, θ, F, K UNIFORM LOADING

$J_u := 1 + \dfrac{\delta}{\gamma}$ $J_u = 1.333$

$\theta_u := 2 \cdot (\alpha + \beta)$ $\theta_u = 17.6$

$F_u := \theta_u - \gamma \cdot {J_u}^2$ $F_u = 3.947$

$K_u := \dfrac{S_u \cdot \theta_u}{\gamma}$ $K_u = 2.2$

$S_p := 0.5638$ FROM TABLE E-3, BTE - PARABOLIC LOADING

$T_p := 0.4000$

VING FOR: J, θ, F, K PARABOLIC LOADING

$_p := 1 + \frac{\delta}{\gamma}$ $J_p = 1.333$

$_p := 2 \cdot (\alpha + \beta)$ $\theta_p = 17.6$

$_p := \theta_p - \gamma \cdot J_p^{\,2}$ $F_p = 3.947$

$_p := \frac{S_p \cdot \theta_p}{\gamma}$ $K_p = 1.292$

VING FOR: MOMENT, AXIAL, SHEAR

$$\phi := \begin{pmatrix} 63.4333 \\ 58.0000 \\ 50.2000 \\ 38.6667 \\ 21.8000 \\ 0 \end{pmatrix} \cdot \frac{\pi}{180} \qquad \phi = \begin{pmatrix} 1.107 \\ 1.012 \\ 0.876 \\ 0.675 \\ 0.38 \\ 0 \end{pmatrix}$$

FROM TABLE E-2, BTE

UNIFORM LOADING

$H_{u1} := \frac{w_u \cdot L}{F_u \cdot f} \cdot (K_u - 2 \cdot J_u \cdot T_u)$ $H_{u1} = 0.769\,\text{kip}$

$V_{u1} := \frac{w_u}{2}$ $V_{u1} = 1.537\,\text{kip}$

INVESTIGATION AT TENTH POINTS

$x := 0 \cdot L$

$N_{ux0} := H_{u1} \cdot \cos(\phi_{0,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{0,0})$ $N_{ux0} = 1.719\,\text{kip}$

$x := 0.1 \cdot L$

$N_{ux1} := H_{u1} \cdot \cos(\phi_{1,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{1,0})$ $N_{ux1} = 1.451\,\text{kip}$

$x := 0.2 \cdot L$

$N_{ux2} := H_{u1} \cdot \cos(\phi_{2,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{2,0})$ $N_{ux2} = 1.201\,\text{kip}$

$x := 0.3 \cdot L$

$$N_{ux3} := H_{u1} \cdot \cos(\phi_{3,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{3,0}) \qquad N_{ux3} = 0.985\,\text{kip}$$

$x := 0.4 \cdot L$

$$N_{ux4} := H_{u1} \cdot \cos(\phi_{4,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{4,0}) \qquad N_{ux4} = 0.829\,\text{kip}$$

$x := 0.5 \cdot L$

$$N_{ux5} := H_{u1} \cdot \cos(\phi_{5,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{5,0}) \qquad N_{ux5} = 0.769\,\text{kip}$$

$$N_{ux} := \begin{pmatrix} N_{ux0} \\ N_{ux1} \\ N_{ux2} \\ N_{ux3} \\ N_{ux4} \\ N_{ux5} \end{pmatrix} \qquad N_{ux} = \begin{pmatrix} 1.719 \\ 1.451 \\ 1.201 \\ 0.985 \\ 0.829 \\ 0.769 \end{pmatrix} \text{kip}$$

PARAPOLIC LOADING

$$M_{p1} := \frac{w_p \cdot L}{F_p} \cdot (J_p \cdot S_p - 2 \cdot T_p) \qquad M_{p1} = -0.826\,\text{ft} \cdot \text{kip}$$

$$H_{p1} := \frac{w_p \cdot L}{F_p \cdot f} \cdot (K_p - 2 \cdot J_p \cdot T_p) \qquad H_{p1} = 0.514\,\text{kip}$$

$$V_{p1} := \frac{w_p}{2} \qquad V_{p1} = 2.25\,\text{kip}$$

INVESTIGATION AT TENTH POINTS

$x := 0 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L} \qquad y = 0\,\text{ft}$$

$$M_{px0} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px0} = -0.826\,\text{ft} \cdot \text{kip}$$

$$N_{px0} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{0,0}) + H_{p1} \cdot \cos(\phi_{0,0}) \qquad N_{px0} = 2.242\,\text{kip}$$

$$Q_{px0} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{0,0}) - H_{p1} \cdot \sin(\phi_{0,0}) \qquad Q_{px0} = 0.547\,\text{kip}$$

$x := 0.1 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px1} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px1} = 0.278\,\text{ft} \cdot \text{kip}$$

$$N_{px1} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{1,0}) + H_{p1} \cdot \cos(\phi_{1,0}) \qquad N_{px1} = 1.249\,\text{kip}$$

$$Q_{px1} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{1,0}) - H_{p1} \cdot \sin(\phi_{1,0}) \qquad Q_{px1} = 0.175\,\text{kip}$$

$x := 0.2 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px2} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px2} = 0.38\,\text{ft} \cdot \text{kip}$$

$$N_{px2} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{2,0}) + H_{p1} \cdot \cos(\phi_{2,0}) \qquad N_{px2} = 0.702\,\text{kip}$$

$$Q_{px2} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{2,0}) - H_{p1} \cdot \sin(\phi_{2,0}) \qquad Q_{px2} = -0.084\,\text{kip}$$

$x := 0.3 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px3} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px3} = 0.047\,\text{ft} \cdot \text{kip}$$

$$N_{px3} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{3,0}) + H_{p1} \cdot \cos(\phi_{3,0}) \qquad N_{px3} = 0.491\,\text{kip}$$

$$Q_{px3} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{3,0}) - H_{p1} \cdot \sin(\phi_{3,0}) \qquad Q_{px3} = -0.209\,\text{kip}$$

$x := 0.4 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$$

$$M_{px4} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px4} = -0.314\,\text{ft} \cdot \text{kip}$$

$$N_{px4} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{4,0}) + H_{p1} \cdot \cos(\phi_{4,0}) \qquad N_{px4} = 0.484\,\text{kip}$$

$$Q_{px4} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{4,0}) - H_{p1} \cdot \sin(\phi_{4,0}) \qquad Q_{px4} = -0.174\,\text{kip}$$

$$x := 0.5\cdot L$$

$$y := 4\cdot f\cdot\left(1-\frac{x}{L}\right)\cdot\frac{x}{L}$$

$$M_{px5} := M_{p1}+\frac{w_p\cdot L}{16}\cdot\left[1-\left(\frac{L-2\cdot x}{L}\right)^4\right]-H_{p1}\cdot y \qquad M_{px5} = -0.461\,\text{ft}\cdot\text{kip}$$

$$N_{px5} := \left(\frac{w_p}{2}\right)\cdot\left(\frac{L-2\cdot x}{L}\right)^3\cdot\sin\left(\phi_{5,0}\right)+H_{p1}\cdot\cos\left(\phi_{5,0}\right) \qquad N_{px5} = 0.514\,\text{kip}$$

$$Q_{px5} := \left(\frac{w_p}{2}\right)\cdot\left(\frac{L-2\cdot x}{L}\right)^3\cdot\cos\left(\phi_{5,0}\right)-H_{p1}\cdot\sin\left(\phi_{5,0}\right) \qquad Q_{px5} = 0\,\text{kip}$$

$$M_{px} := \begin{pmatrix} M_{px0} \\ M_{px1} \\ M_{px2} \\ M_{px3} \\ M_{px4} \\ M_{px5} \end{pmatrix} \qquad N_{px} := \begin{pmatrix} N_{px0} \\ N_{px1} \\ N_{px2} \\ N_{px3} \\ N_{px4} \\ N_{px5} \end{pmatrix} \qquad Q_{px} := \begin{pmatrix} Q_{px0} \\ Q_{px1} \\ Q_{px2} \\ Q_{px3} \\ Q_{px4} \\ Q_{px5} \end{pmatrix}$$

$$M_{px} = \begin{pmatrix} -0.826 \\ 0.278 \\ 0.38 \\ 0.047 \\ -0.314 \\ -0.461 \end{pmatrix}\text{ft}\cdot\text{kip} \qquad N_{px} = \begin{pmatrix} 2.242 \\ 1.249 \\ 0.702 \\ 0.491 \\ 0.484 \\ 0.514 \end{pmatrix}\text{kip} \qquad Q_{px} = \begin{pmatrix} 0.547 \\ 0.175 \\ -0.084 \\ -0.209 \\ -0.174 \\ 0 \end{pmatrix}\text{kip}$$

COMPRESSIVE AND SHEAR STRESS CALCULATIONS

$$f_{mmax} := \frac{N_{ux}+N_{px}}{t\cdot d}+\frac{6\cdot M_{px}}{t\cdot d^2} \qquad f_{mmin} := \frac{N_{ux}+N_{px}}{t\cdot d}-\frac{6\cdot M_{px}}{t\cdot d^2}$$

$$f_{mmax} = \begin{pmatrix} -16.517 \\ 39.157 \\ 38.637 \\ 15.145 \\ -7.898 \\ -16.986 \end{pmatrix}\text{psi} \qquad f_{mmin} = \begin{pmatrix} 82.544 \\ 5.846 \\ -6.909 \\ 9.46 \\ 29.773 \\ 38.376 \end{pmatrix}\text{psi}$$

$$v_m := \frac{Q_{px}}{t\cdot d} \qquad v_m = \begin{pmatrix} 4.555 \\ 1.455 \\ -0.698 \\ -1.739 \\ -1.451 \\ 0 \end{pmatrix}\text{psi}$$

VE LOAD CHECK

FOR 41 TON TRUCK

$$H_{12} := \frac{2 \cdot P_{41} \cdot L}{F_u \cdot f} \cdot \left(K_u - 2 \cdot J_u \cdot T_u\right) \qquad H_{12} = 9.259\,\text{kip}$$

INFLUENCE OF 1 AXLE

$x := 0 \cdot L$

$$N_{12x0} := H_{12} \cdot \cos\left(\phi_{0,0}\right) + \frac{2 \cdot P_{41}}{2} \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin\left(\phi_{0,0}\right) \qquad N_{12x0} = 20.687\,\text{kip}$$

$$f_{mmaxTL} := \frac{N_{12x0} + N_{ux} + N_{px}}{t \cdot d} + \frac{6 \cdot M_{px}}{t \cdot d^2} \qquad f_{mminTL} := \frac{N_{12x0} + N_{ux} + N_{px}}{t \cdot d} - \frac{6 \cdot M_{px}}{t \cdot d^2}$$

$$f_{mmaxTL_{0,0}} = 155.878\,\text{psi} \qquad f_{mminTL_{0,0}} = 254.939\,\text{psi}$$

FOR 50 TON TRUCK

$$H_{16} := \frac{2 \cdot P_{50} \cdot L}{F_u \cdot f} \cdot \left(K_u - 2 \cdot J_u \cdot T_u\right) \qquad H_{16} = 11.26\,\text{kip}$$

INFLUENCE OF 1 AXLE

$x := 0 \cdot L$

$$N_{16x0} := H_{12} \cdot \cos\left(\phi_{0,0}\right) + \frac{2 \cdot P_{50}}{2} \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin\left(\phi_{0,0}\right) \qquad N_{16x0} = 24.265\,\text{kip}$$

$$f_{mmaxTL} := \frac{N_{16x0} + N_{ux} + N_{px}}{t \cdot d} + \frac{6 \cdot M_{px}}{t \cdot d^2} \qquad f_{mminTL} := \frac{N_{16x0} + N_{ux} + N_{px}}{t \cdot d} - \frac{6 \cdot M_{px}}{t \cdot d^2}$$

$$f_{mmaxTL_{0,0}} = 185.692\,\text{psi} \qquad f_{mminTL_{0,0}} = 284.753\,\text{psi}$$

ALLOWABLE COMPRESSIVE STRESS (SEE BOYLSTON ST. CALC'S)

$f_c = 350$ PSI > 285 PSI ✓ OK

Project: MUDDY RIVER
Project # 06967
Location:
Sheet of
Calculated by: BFB
Date: 6 21·00
Checked by:
Date:
Title JAMAICAWAY EXIT - SHEAR CHECK

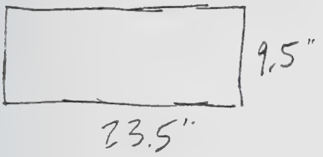
IRE CONTACT AREA

AASHTO 3.30

$$\text{AREA} = 0.01 \times P = 0.01 \times 22{,}500^{\#} = 225 \text{ IN}^2$$

$$\frac{1}{2.5} = \frac{\text{LENGTH}}{\text{WIDTH}}$$

$$2.5x^2 = 225 \text{ IN}^2$$
$$x^2 = 90 \text{ IN}^2$$
$$x \simeq 9.5 \text{ IN}$$



PERIMETER = 66"

DEPTH = 10"

$P \times D = 660 \text{ IN}^2$ PUNCHING SHEAR AREA.

$$V_{LL} = \frac{P}{A} = \frac{22.5 \text{ K}}{660 \text{ IN}^2} = 0.0341 \text{ KSI}$$

$$+\ \underline{0.0046 \text{ KSI}} \quad \text{FROM DL}$$

$$0.0387 \text{ KSI} = 38.7 \text{ PSI}$$

ALLOWABLE SHEAR

ACI 318·95 A.3.

$$V_c = 1.1 \times \sqrt{f'_c} = 1.1 \times \sqrt{4000} = 69.6 \text{ PSI}$$

69.6 PSI > 38.7 PSI ✓ OK

GN·

WARD'S POND (MASONRY STRUCTURE ALONG POND AVENUE, STRUCTURE NO. 5)

NOTE: TOTAL WIDTH OF BRIDGE IS 19' +/-

TANTS

$kip := 1000 \cdot lb$ $\quad psi := \frac{lb}{in^2}$ $\quad ksi := \frac{kip}{in^2}$ $\quad pcf := \frac{lb}{ft^3}$ $\quad klf := \frac{kip}{ft}$

$ksf := \frac{kip}{ft^2}$ $\quad psf := \frac{lb}{ft^2}$ $\quad ton := 2 \cdot kip$

TS:

$\gamma_1 := 150 \cdot \frac{lb}{ft^3}$ ROADWAY MATERIAL

$\gamma_2 := 120 \cdot \frac{lb}{ft^3}$ SOIL

$P_{41} := 18.5 \cdot kip$

TRUCK LIVE LOAD, POINT LOADS

$P_{50} := 22.5 \cdot kip$

$depth_{soil} := 1.25 \cdot ft$ SOIL DEPTH AT TOP OF ARCH

$depth_{road} := 0 \cdot in$ DEPTH OF ROADWAY MATERIAL

RCH INFORMATION

$arch_{sw} := 85 \cdot \frac{lb}{ft}$ APPROXIMATE ARCH SELFWEIGHT

$L := 6 \cdot ft$ ARCH SPAN

$d := 8 \cdot in$

$t := 12 \cdot in$ PRINCIPLE ARCH DIMENSIONS

$f := 3 \cdot ft$

$\frac{f}{L} = 0.5$

$k := 2.40$ FROM TABLE E-1, BRICK & TILE ENGINEERING (BTE)

$\alpha := 6.24$

$\beta := 2.56$

$\gamma := 7.680$ FROM TABLE E-4, BTE

$\delta := 2.560$

COMPUTATIONS:

LOADINGS

$roadway := depth_{road} \cdot \gamma_1 \cdot t$ $\quad roadway = 0 \dfrac{lb}{ft}$

$soil\_load := depth_{soil} \cdot \gamma_2 \cdot t$ $\quad soil\_load = 150 \dfrac{lb}{ft}$

$\omega_{total} := roadway + soil\_load + arch_{sw}$ $\quad \omega_{total} = 0.235 \dfrac{kip}{ft}$

$w_u := \omega_{total} \cdot L$ TOTAL UNIFORM LOAD $\quad w_u = 1.41\ kip$

$P_p := f \cdot \gamma_2 \cdot t$ $\quad P_p = 360 \dfrac{lb}{ft}$

$w_p := \dfrac{P_p \cdot L}{3}$ COMPLEMENTARY PARABOLIC LOAD $\quad w_p = 0.72\ kip$

$S_u := 0.9602$

$T_u := 0.6400$

FROM TABLE E-3, BTE - UNIFORM LOADING

SOLVING FOR: J, θ, F, K UNIFORM LOADING

$J_u := 1 + \dfrac{\delta}{\gamma}$ $\quad J_u = 1.333$

$\theta_u := 2 \cdot (\alpha + \beta)$ $\quad \theta_u = 17.6$

$F_u := \theta_u - \gamma \cdot J_u^2$ $\quad F_u = 3.947$

$K_u := \dfrac{S_u \cdot \theta_u}{\gamma}$ $\quad K_u = 2.2$

$S_p := 0.5638$

$T_p := 0.4000$

FROM TABLE E-3, BTE - PARABOLIC LOADING

VING FOR: J, θ, F, K PARABOLIC LOADING

$$J_p := 1 + \frac{\delta}{\gamma} \qquad J_p = 1.333$$

$$\theta_p := 2\cdot(\alpha + \beta) \qquad \theta_p = 17.6$$

$$F_p := \theta_p - \gamma\cdot J_p^{\,2} \qquad F_p = 3.947$$

$$K_p := \frac{S_p\cdot\theta_p}{\gamma} \qquad K_p = 1.292$$

VING FOR: MOMENT, AXIAL, SHEAR

$$\phi := \begin{pmatrix} 63.4333 \\ 58.0000 \\ 50.2000 \\ 38.6667 \\ 21.8000 \\ 0 \end{pmatrix}\cdot\frac{\pi}{180} \qquad \phi = \begin{pmatrix} 1.107 \\ 1.012 \\ 0.876 \\ 0.675 \\ 0.38 \\ 0 \end{pmatrix}$$

FROM TABLE E-2, BTE

UNIFORM LOADING

$$H_{u1} := \frac{w_u\cdot L}{F_u\cdot f}\cdot\left(K_u - 2\cdot J_u\cdot T_u\right) \qquad H_{u1} = 0.353\,\text{kip}$$

$$V_{u1} := \frac{w_u}{2} \qquad V_{u1} = 0.705\,\text{kip}$$

INVESTIGATION AT TENTH POINTS

$x := 0\cdot L$

$$N_{ux0} := H_{u1}\cdot\cos\left(\phi_{0,0}\right) + \left(\frac{w_u}{2}\right)\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin\left(\phi_{0,0}\right) \qquad N_{ux0} = 0.788\,\text{kip}$$

$x := 0.1\cdot L$

$$N_{ux1} := H_{u1}\cdot\cos\left(\phi_{1,0}\right) + \left(\frac{w_u}{2}\right)\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin\left(\phi_{1,0}\right) \qquad N_{ux1} = 0.665\,\text{kip}$$

$x := 0.2\cdot L$

$$N_{ux2} := H_{u1}\cdot\cos\left(\phi_{2,0}\right) + \left(\frac{w_u}{2}\right)\cdot\left(1 - \frac{2\cdot x}{L}\right)\cdot\sin\left(\phi_{2,0}\right) \qquad N_{ux2} = 0.551\,\text{kip}$$

$x := 0.3 \cdot L$

$$N_{ux3} := H_{u1} \cdot \cos(\phi_{3,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{3,0}) \qquad N_{ux3} = 0.452\,\text{kip}$$

$x := 0.4 \cdot L$

$$N_{ux4} := H_{u1} \cdot \cos(\phi_{4,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{4,0}) \qquad N_{ux4} = 0.38\,\text{kip}$$

$x := 0.5 \cdot L$

$$N_{ux5} := H_{u1} \cdot \cos(\phi_{5,0}) + \left(\frac{w_u}{2}\right) \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin(\phi_{5,0}) \qquad N_{ux5} = 0.353\,\text{kip}$$

$$N_{ux} := \begin{pmatrix} N_{ux0} \\ N_{ux1} \\ N_{ux2} \\ N_{ux3} \\ N_{ux4} \\ N_{ux5} \end{pmatrix} \qquad N_{ux} = \begin{pmatrix} 0.788 \\ 0.665 \\ 0.551 \\ 0.452 \\ 0.38 \\ 0.353 \end{pmatrix} \text{kip}$$

PARAPOLIC LOADING

$$M_{p1} := \frac{w_p \cdot L}{F_p} \cdot (J_p \cdot S_p - 2 \cdot T_p) \qquad M_{p1} = -0.053\,\text{ft} \cdot \text{kip}$$

$$H_{p1} := \frac{w_p \cdot L}{F_p \cdot f} \cdot (K_p - 2 \cdot J_p \cdot T_p) \qquad H_{p1} = 0.082\,\text{kip}$$

$$V_{p1} := \frac{w_p}{2} \qquad V_{p1} = 0.36\,\text{kip}$$

INVESTIGATION AT TENTH POINTS

$x := 0 \cdot L$

$$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L} \qquad y = 0\,\text{ft}$$

$$M_{px0} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px0} = -0.053\,\text{ft} \cdot \text{kip}$$

$$N_{px0} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{0,0}) + H_{p1} \cdot \cos(\phi_{0,0}) \qquad N_{px0} = 0.359\,\text{kip}$$

$$Q_{px0} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{0,0}) - H_{p1} \cdot \sin(\phi_{0,0}) \qquad Q_{px0} = 0.087\,\text{kip}$$

$x := 0.1 \cdot L$

$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$

$M_{px1} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y$ $\qquad M_{px1} = 0.018\,\text{ft} \cdot \text{kip}$

$N_{px1} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{1,0}) + H_{p1} \cdot \cos(\phi_{1,0})$ $\qquad N_{px1} = 0.2\,\text{kip}$

$Q_{px1} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{1,0}) - H_{p1} \cdot \sin(\phi_{1,0})$ $\qquad Q_{px1} = 0.028\,\text{kip}$

$x := 0.2 \cdot L$

$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$

$M_{px2} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y$ $\qquad M_{px2} = 0.024\,\text{ft} \cdot \text{kip}$

$N_{px2} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{2,0}) + H_{p1} \cdot \cos(\phi_{2,0})$ $\qquad N_{px2} = 0.112\,\text{kip}$

$Q_{px2} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{2,0}) - H_{p1} \cdot \sin(\phi_{2,0})$ $\qquad Q_{px2} = -0.013\,\text{kip}$

$x := 0.3 \cdot L$

$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$

$M_{px3} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y$ $\qquad M_{px3} = 3.032 \times 10^{-3}\,\text{ft} \cdot \text{kip}$

$N_{px3} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{3,0}) + H_{p1} \cdot \cos(\phi_{3,0})$ $\qquad N_{px3} = 0.079\,\text{kip}$

$Q_{px3} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{3,0}) - H_{p1} \cdot \sin(\phi_{3,0})$ $\qquad Q_{px3} = -0.033\,\text{kip}$

$x := 0.4 \cdot L$

$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$

$M_{px4} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y$ $\qquad M_{px4} = -0.02\,\text{ft} \cdot \text{kip}$

$N_{px4} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{4,0}) + H_{p1} \cdot \cos(\phi_{4,0})$ $\qquad N_{px4} = 0.077\,\text{kip}$

$Q_{px4} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{4,0}) - H_{p1} \cdot \sin(\phi_{4,0})$ $\qquad Q_{px4} = -0.028\,\text{kip}$

$x := 0.5 \cdot L$

$y := 4 \cdot f \cdot \left(1 - \frac{x}{L}\right) \cdot \frac{x}{L}$

$$M_{px5} := M_{p1} + \frac{w_p \cdot L}{16} \cdot \left[1 - \left(\frac{L - 2 \cdot x}{L}\right)^4\right] - H_{p1} \cdot y \qquad M_{px5} = -0.03\,\text{ft}\cdot\text{kip}$$

$$N_{px5} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \sin(\phi_{5,0}) + H_{p1} \cdot \cos(\phi_{5,0}) \qquad N_{px5} = 0.082\,\text{kip}$$

$$Q_{px5} := \left(\frac{w_p}{2}\right) \cdot \left(\frac{L - 2 \cdot x}{L}\right)^3 \cdot \cos(\phi_{5,0}) - H_{p1} \cdot \sin(\phi_{5,0}) \qquad Q_{px5} = 0\,\text{kip}$$

$$M_{px} := \begin{pmatrix} M_{px0} \\ M_{px1} \\ M_{px2} \\ M_{px3} \\ M_{px4} \\ M_{px5} \end{pmatrix} \qquad N_{px} := \begin{pmatrix} N_{px0} \\ N_{px1} \\ N_{px2} \\ N_{px3} \\ N_{px4} \\ N_{px5} \end{pmatrix} \qquad Q_{px} := \begin{pmatrix} Q_{px0} \\ Q_{px1} \\ Q_{px2} \\ Q_{px3} \\ Q_{px4} \\ Q_{px5} \end{pmatrix}$$

$$M_{px} = \begin{pmatrix} -0.053 \\ 0.018 \\ 0.024 \\ 3.032 \times 10^{-3} \\ -0.02 \\ -0.03 \end{pmatrix} \text{ft}\cdot\text{kip} \quad N_{px} = \begin{pmatrix} 0.359 \\ 0.2 \\ 0.112 \\ 0.079 \\ 0.077 \\ 0.082 \end{pmatrix} \text{kip} \qquad Q_{px} = \begin{pmatrix} 0.087 \\ 0.028 \\ -0.013 \\ -0.033 \\ -0.028 \\ 0 \end{pmatrix} \text{kip}$$

COMPRESSIVE AND SHEAR STRESS CALCULATIONS

$$f_{mmax} := \frac{N_{ux} + N_{px}}{t \cdot d} + \frac{6 \cdot M_{px}}{t \cdot d^2} \qquad f_{mmin} := \frac{N_{ux} + N_{px}}{t \cdot d} - \frac{6 \cdot M_{px}}{t \cdot d^2}$$

$$f_{mmax} = \begin{pmatrix} 6.996 \\ 10.678 \\ 9.186 \\ 5.808 \\ 2.881 \\ 1.764 \end{pmatrix} \text{psi} \qquad f_{mmin} = \begin{pmatrix} 16.902 \\ 7.347 \\ 4.631 \\ 5.239 \\ 6.648 \\ 7.3 \end{pmatrix} \text{psi}$$

$$v_m := \frac{Q_{px}}{t \cdot d} \qquad v_m = \begin{pmatrix} 0.911 \\ 0.291 \\ -0.14 \\ -0.348 \\ -0.29 \\ 0 \end{pmatrix} \text{psi}$$

E LOAD CHECK

FOR 41 TON TRUCK

$H_{12} := \frac{P_{41} \cdot L}{F_u \cdot f} \cdot \left(K_u - 2 \cdot J_u \cdot T_u\right)$ $H_{12} = 4.629\,\text{kip}$ INFLUENCE OF 1 AXLE

$x := 0 \cdot L$

$N_{12x0} := H_{12} \cdot \cos\left(\phi_{0,0}\right) + \frac{P_{41}}{2} \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin\left(\phi_{0,0}\right)$ $N_{12x0} = 10.344\,\text{kip}$

$f_{mmaxTL} := \frac{N_{12x0} + N_{ux} + N_{px}}{t \cdot d} + \frac{6 \cdot M_{px}}{t \cdot d^2}$ $f_{mminTL} := \frac{N_{12x0} + N_{ux} + N_{px}}{t \cdot d} - \frac{6 \cdot M_{px}}{t \cdot d^2}$

$f_{mmaxTL_{0,0}} = 114.743\,\text{psi}$ $f_{mminTL_{0,0}} = 124.65\,\text{psi}$

FOR 50 TON TRUCK

$H_{16} := \frac{P_{50} \cdot L}{F_u \cdot f} \cdot \left(K_u - 2 \cdot J_u \cdot T_u\right)$ $H_{16} = 5.63\,\text{kip}$ INFLUENCE OF 1 AXLE

$x := 0 \cdot L$

$N_{16x0} := H_{12} \cdot \cos\left(\phi_{0,0}\right) + \frac{P_{50}}{2} \cdot \left(1 - \frac{2 \cdot x}{L}\right) \cdot \sin\left(\phi_{0,0}\right)$ $N_{16x0} = 12.133\,\text{kip}$

$f_{mmaxTL} := \frac{N_{16x0} + N_{ux} + N_{px}}{t \cdot d} + \frac{6 \cdot M_{px}}{t \cdot d^2}$ $f_{mminTL} := \frac{N_{16x0} + N_{ux} + N_{px}}{t \cdot d} - \frac{6 \cdot M_{px}}{t \cdot d^2}$

$f_{mmaxTL_{0,0}} = 133.377\,\text{psi}$ $f_{mminTL_{0,0}} = 143.283\,\text{psi}$

PENDIX D – LIST OF REFERENCE MATERIALS

Agency	Bridge Name	Drawing Title	Drawing Date
Boston Park and Recreational Services	Backbay Fens #1	Back Bay Fens Bridges – Phase 2; Arch bridge Details – 1 (Sheet 5)	No Date Shown
	Backbay Fens #2	Back Bay Fens Bridges – Phase 2; Arch bridge Details – 1 (Sheet 5)	No Date Shown
	Longwood Ave	Longwood Ave. Bridge (Sheet 2)	July 1, 1897
	Leverett Pond	Muddy River Improvement Masonry Structures along Pond Avenue (Sheet No.1)	July 1892
	Willow Pond Road	Muddy River Improvement Masonry Structures along Pond Avenue (Sheet No.2)	July 1892
	Willow Pond #2	Muddy River Improvement Masonry Structures along Pond Avenue (Sheet No.2)	July 1892
	Ward's Pond	Muddy River Improvement Masonry Structures along Pond Avenue (Sheet No.2)	July 1892
City of Boston	Railroad Crossing	Boston & Albany RR Bridge over outlet of Pond	March 1881
	Ipswich Street	Ipswich Street over Muddy River	November 18, 1897
	Agassiz Bridge	Back Bay Improvement Agassiz Road Bridge	July 22, 1887
	Avenue Louis Pasteur	Fens Bridge	February 1889
	Cove Bridge	Bridge at Entrance to Cove in Leverett Pond	January 1894
F.L. Olmsted Archives	Netherlands Road	Muddy river Improvement General Design for Bellevue Bridge	September 16, 1891
	Island Bridge #1	Muddy River Improvement Footbridge West of Brookline Ave	September 18, 1891
Frederick Law Olmsted and the Boston Park System by Cynthia Zaitzvsky	Island Bridge #2	Muddy River Improvement General Design for foot bridge East of Bellevue St. Bridge	September 16, 1891
MDC	Boylston Street	Boylston Street Bridge (16 Sheets)	April 1881
MHD	Beacon Street	Beacon Street over Muddy River (Sheet 1 of 9)	March 18, 1980
	Charlesgate (Commonwealth Avenue Westbound)	Commonwealth Avenue over Muddy River (Sheets 1, 2 & 3 of 19)	June 1973
	Charlesgate (Commonwealth Avenue Eastbound)	Commonwealth Avenue over Muddy River (Sheets 1, 2 & 3 of 19)	June 1973
	Brookline Ave	Brookline Ave. Culvert (2 Sheets)	November 1891
	Jamaicaway Exit	Riverway-Jamaicaway over Muddy River (Sheets 1 & 2 of 4)	May 1935
	Route 9	Riverway-Jamaicaway over Muddy River (Sheets 3 & 4 of 4)	May 1935
MTA	I-90	"As-Builts" Structure No. 53 Muddy River (Sheets S53-1,2 &3 of 6)	No Date Shown

PPENDIX E – MISCELLANEOUS REPORTS

t
C

MASSACHUSETTS HIGHWAY DEPARTMENT

UNDERWATER OPERATIONS TEAM

DIVERS ACTIVITY REPORT

bridge dept. no.
B-16-365

vn N	5-facility carried US 1 SB ON RAMP	6-features intersected BEACON ST & MUDDY RIVER	93b-date inspected 12/22/97
8-structure no. MDC 896 30D 131	foundation type	dive master R. BONICA	
n level	access to bridge EMBANKMENT	team members J. FITZGERALD, J. DONAHUE, B. SULLIVAN	
onditions LT, GRAVEL, BOULDERS	water conditions HIGH BACTERIA POLLUTION	depth 2 m +/-	visibility 1 m +/-
current NIL "			

em 60 (Underwater) **7**

bstructure

Abutments

Wings	NA
Breastwall	NA
Pointing	NA
Footings	NA
Piles	NA
Scour	NA
Undermining	NA
Settlement	NA
	NA
	NA

iers or Bents

Stem	7
Pointing	NA
Column	NA
Footing	7
Piles	X
icour	6
Jndermining	NO
Settlement	8
	NA

e Bents

Concrete Piles	NA
imber Piles	NA
iagonal Bracing	NA
lorizontal Bracing	NA
asteners	NA
	NA

4. Fender System

a.) Piles	NA
b.) Diagonal Bracing	NA
c.) Horizontal Bracing	NA
d.) Wales	NA
e.) Fasteners	NA
f.) Ladders	NA
g.)	NA
h.)	NA

Item 61 (Underwater) **7**

Channel and Channel Protection

1. Debris	7
2. Aggradation	7
3. Utilities	X
4. Rip Rap	NA
5.	NA
6.	NA

Item 113 **Scour Critical Bridges**

Scour

a.) Footing Exposed	Y
b.) Undermining	N

Scour Countermeasures

a.) Sheeting	N
b.) Rip Rap	Y
c.) Other	N

Y=YES N=NO

ndermining rated as YES or NO

Submitted by: R. B

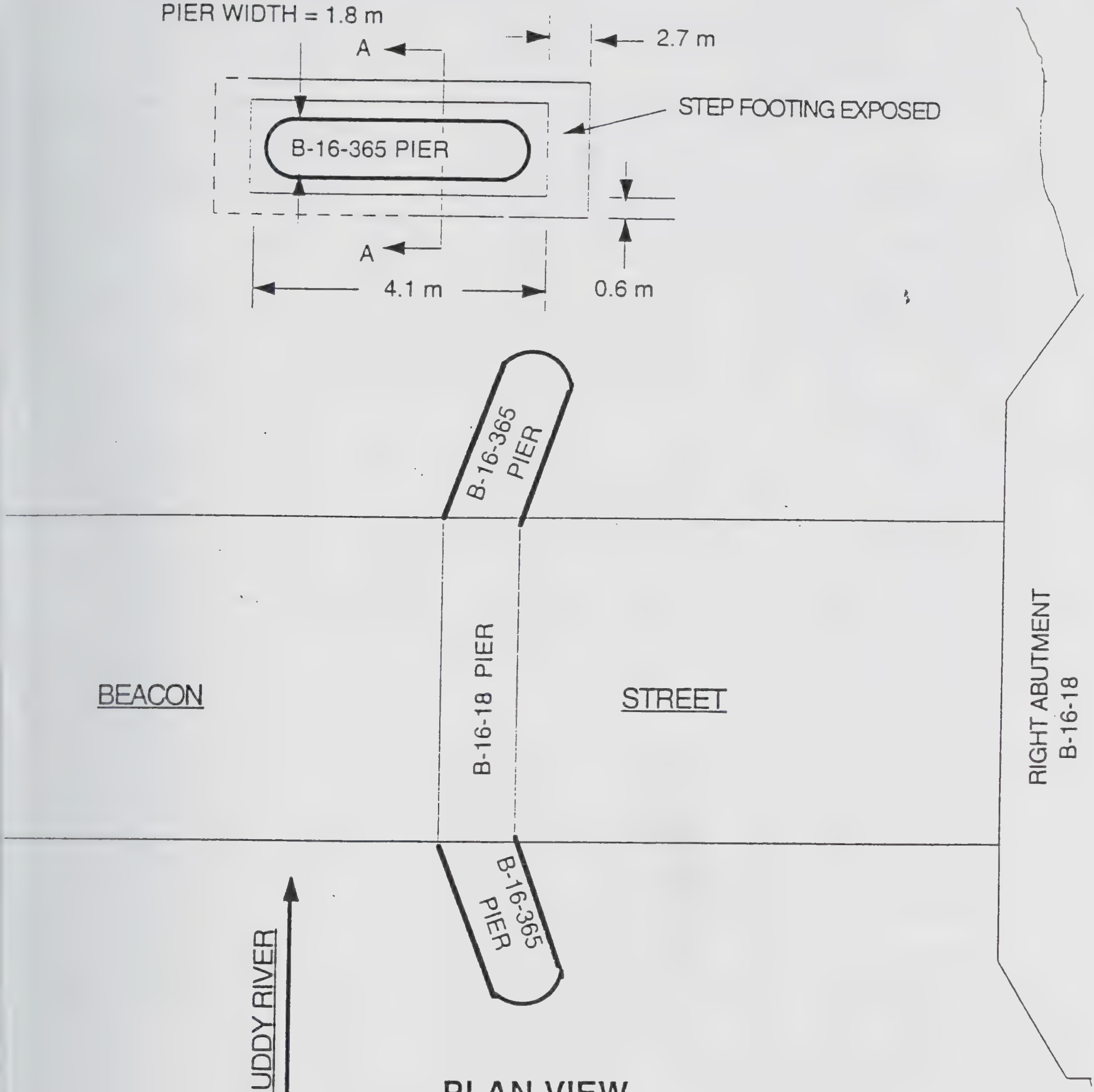
KNOWN NA=NOT APPLICABLE IA=INACCESSIBLE

R FILE

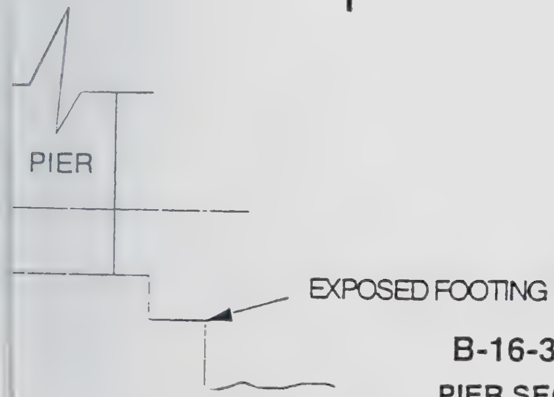
CITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTIO
BOSTON	4FG	B-16-365	MDC 896 30D 131	Decemb

REMARKS & PHOTOS

The underwater elements of this structure consist of 3 concrete piers. Two of the piers are
upstream and downstream ends of the center pier of the bridge which carries Beacon St. o
River (B-16-18). The third concrete pier is located downstream of the Beacon St. Bridge.
two footing steps exposed at the downstream side, right side, and half of the upstream si
View)
Concrete piers have minor concrete abrasion exposing coarse aggregate, at the waterline.



PLAN VIEW
(NTS)



B-16-365(SB)
PIER SECTION 'A-A'
(NTS)

SCOUR MONITORING CHART

	11/26/91	12/10/94	12/22/97
DOWNSTREAM PIER			
US LEFT CORNER	2.2 m	2.1 m	2.2 m
DS LEFT CORNER	1.7 m	1.7 m	2.2 m
US RIGHT CORNER	2.4 m	2.4 m	2.2 m
DS RIGHT CORNER			
ON FTG (2ND STEP)	---	---	2.2 m
OFF FTG	2.4 m	2.3 m	2.4 m
BEACON ST. PIER			
US EXTENSION			
US NOSE	2.4 m	2.4 m	---
DS EXTENSION			
DS NOSE	2.0 m	2.0 m	2.1 m
Y	0.24 m	0.27 m	0.15 m
CORRECTION FACTOR	---	-0.03 m	-0.09 m

NOTES:

1. *WATERLINE TO TOP STEP OF DOWNSTREAM PIER = Y = 0.24 m (11/26/91)*
2. *SOUNDINGS CORRECTED TO 11/26/91 WATERLINE*
3. *ALL MEASUREMENTS ARE IN METRIC*

xtremely high'

anan

ich runs
line from
les River,
levels of
grene and
aboratory

, bacteria
mes high-
es in Bos-
in the re-
' environ-

mental group that commissioned the tests.

"Even one drop of water as contaminated as this is dangerous to people with low immune systems, children or HIV-positive people," said Irene Gillis, chairwoman of Restore Olmsted's Waterway. Speaking at a conference on the Muddy River held at Harvard's School of Public Health yesterday, she and other activists warned residents not to swim in the water, eat fish caught there or even touch the water.

MUDDY, Page B4

lobe 11/17/96

---

show high pollution

■ MUDDY
Continued from Page B1

"Even if your dog runs through this water and you pet him, he can bring waterborne disease into your home," Gillis said.

Restore Olmsted's Waterway is a citizens' group dedicated to cleaning up the Muddy River, the 3½-mile waterway that snakes through the Emerald Necklace of parks and green space designed 100 years ago by Frederick Law Olmsted.

The group's decade-long fight over the Muddy took on renewed importance in the last few weeks when the reed-choked and sewage-contaminated river flooded into residential basements and subway stations. The river has flooded twice in the last two months and polluted water from the Muddy flows into the Charles River.

Former Gov. Michael S. Dukakis, in an interview at the conference, faulted his successor in the State House for not taking leadership in stopping pollution of a riverway that passes close to the homes of thousands of Boston and Brookline residents.

"This is a state responsibility, and you know who should be here? The guy in the governor's office. It's one thing to say you care about the environment, and it's another to put your money where your mouth is," Dukakis said of Gov. William F. Weld.

"If he had taken a dive in [the Muddy River] at Charlesgate, he'd never have come up," Dukakis said in a mocking reference to Weld's much-hyped splash into the Charles River after signing a rivers protection bill.

But Weld's spokesman, Bob Bliss, expressed disbelief that Dukakis would wag a finger at Weld.

"I'm surprised that Gov. Dukakis, who was a few days late and a couple of hundred million dollars short in cleaning up Boston Harbor, would be criticizing anyone on an environmental cleanup," Bliss said.

Rick Lombardi, a spokesman for the state Executive Office of Environmental Affairs, insisted that Weld "has taken the initiative" to clean up the river. "We have appointed a mediator to work with a multitude of groups, the city of Boston, Massachusetts Water Resources Authority and the Army Corps of Engineers to try to bring a plan into action," he said.

Samples taken last month from sediment at the base of the Netherlands Road bridge in Brookline, near the town's water and sewer works, found 63,000 colonies per gram of clostridium perfringens bacteria, which can cause gas gangrene and gastrointestinal disorders, according to Fred Youngs, director of the Citizens' Environmental Laboratory in Cambridge. That is 21 times higher than the levels recorded at sewage outfalls in the harbor, he said.

The clostridium signals the presence of other pathogens or disease-bearing organisms such as hepatitis A, staphylococcus and salmonella, Youngs said.

The tests also found elevated levels of the waterborne pathogen enterococcus. In one spot, the bacteria was measured at 5 ½ times the level permitted by Environmental Protection Agency guidelines.

Youngs noted that the levels of fecal coliform – which indicates the presence of raw human sewage in water – measured in the Muddy in a 1992 study by the Army Corps of Engineers was in some cases between 1,000 and 2,500 times higher than EPA guidelines, outstripping the levels in the Charles River that caused alarm a few months ago.

Documents obtained recently indicate that in 1992, when the dangerously elevated levels of fecal coliform were found in the Muddy River, federal officials rejected as too costly plans to improve flood control along the river.

But damage and cleanup costs for the MBTA from last month's flooding – which forced the closing of the Kenmore Square station for several days and disrupted service for 200,000 riders – is expected to run between $15 and $20 million, calling into question the Army Corps of Engineers' recommendation rejecting flood control four years ago.

Cathleen Douglas Stone, environmental services director for the city of Boston, said Mayor Thomas M. Menino has a commitment to preserving open space in the city, and is studying ways to limit pollution of the Muddy, from reducing or eliminating discharge into the river to keeping Boston streets cleaner so garbage won't blow into the river.

Dr. Alan Balsam, director of Brookline's Public Health Department, warned that people should be cautious about recreational activity near the Muddy.

But Balsam added that Brookline aims within the next year and a half to fix all 39 improper sewer hookups or discharges that are polluting the Muddy with sewage.

PAGE 5 OF 5

Element Data Collection Form

Month	Day	Year
12	22	97

Bridge Number B-16-365

Town BOSTON

BIN 4FG

District MDC

Bridge Key Number MDC 896 30D 131

Inspectors BONICA | DONAHUE, FITZGERALD, SULLIVAN | U/W OPNS
Leader | Member | Agency/Consultant/Dept. Name

ent	Units	Env-iron.	Total Quantity	Condition States (Quantity or Percent) *					Q or P *
				1	2	3	4	5	
VALL	M	2	11.5	11.5					Q
MERGED FOOTING	EA	2	1	1					Q

ch between Quantity and Percent for different Elements.

MASSACHUSETTS HIGHWAY DEPARTMENT
STRUCTURES INSPECTION FIELD REPORT
ROUTINE INSPECTION

B.I.N.: 4FG

PAGE 1 OF 3

BR. DEPT. NO.: B16365

STON

8-STRUCTURES NO.: MDC89630D131

11-MILE POINT: 000.010

41-STATUS: P

90-ROUTINE INSP DATE: 7-11-97

Y CARRIED: 1 SB ON RAMP

MEMORIAL NAME/LOCAL NAME: BOWKER ON BEACON ST, MUDDY RIVER

27-YR BUILT: 1965

106-YR REBUILT:

YR REHAB'D (NON 106: 1993

ES INTERSECTED: ON ST. MUDDY RIVER

26-FUNCTIONAL CLASS.: URBAN ART.

DIST. BRIDGE INSPECTION ENGINEER: David L Lichard

CONSULTANT'S STAMP:

URE TYPE: DER FLOOR BEAM

22-OWNER: MDC

21-MAINTAINER: MDC

TEAM LEADER: R.E. C— CARR

YPE: CRETE C.I.P.

WEATHER: SUNNY

TEMP(a): 70's

TEMP(c):

TEAM MEMBERS: J. YUAN, J. DAVISON

	6	DEF
surface	6	M.P.
ndition	6	M.P
lace forms	N	1
	7	1
	N	1
s	7	1
	3	S.P.
	3	S.P.
lle Fence	N	1
System	5	M.P
Standards	[illegible]	[illegible]
	N	[illegible]
ts	6	M.P
	[illegible]	[illegible]
	[illegible]	[illegible]
	[illegible]	[illegible]

	N/E	S/W
L	7	8

S		DEF
t condition	7	1
/ Settlement	7	1
Settlement	H	1

IGNS (Y/N) N

		DEF
lks	N	1
ts	N	1
ns	N	1

ITEM 59

SUPERSTRUCTURE	7	DEF
1. Stringers	N	1
2. Floorbeams	6	M.P.
3. Floor System Bracing	N	1
4. Girders or Beams	6	M.P
5. Trusses - General	N	1
a. Upper Chords	N	1
b. Lower Chords	N	1
c. Web Members	N	1
d. Lateral Bracings	N	1
e. Sway Bracings	N	1
f. Portals	[illegible]	[illegible]
g. End Posts	N	[illegible]
6. Pin & Hangers	N	[illegible]
7. Conn Plt's, Gussets & Angles	[illegible]	[illegible]
8. Cover Plates	7	[illegible]
9. Bearing Devices	7	[illegible]
10. Diaphragms/Cross Frames	7	1
11. Rivets & Bolts	7	1
12. Welds	7	1
13. Member Alignment	8	1
14. Paint/Coating	6	M.P.
15.		

Year Painted: 1965

COLLISION DAMAGE: *Please explain*
None (✓) Minor ( ) Moderate ( ) Severe ( )

LOAD DEFLECTION: *Please explain*
None ( ) Minor (✓) Moderate ( ) Severe ( )

LOAD VIBRATION: *Please explain*
None ( ) Minor (✓) Moderate ( ) Severe ( )

Any Fracture Critical Member : (Y/N) N

Any Cracks : (Y/N) N

ITEM 60

SUBSTRUCTURE	7	DEF
1. Abutments	7	
a. Wingwalls	7	1
b. Backwalls	7	1
c. Breastwalls	7	1
d. Bridge Seats	7	1
e. Pedestals	7	1
f. Footings	H	1
g. Piles	H	1
2. Piers or Bents	7	
a. Caps	7	1
b. Pedestals	7	1
c. Columns	N	1
d. Webs	7	1
e. Footings	H	[illegible]
f. Piles	H	[illegible]
3. Pile Bents	N	
a. Piles	N	1
b. Diagonal Bracing	N	[illegible]
c. Horizontal Bracing	[illegible]	[illegible]
d. Fasteners	[illegible]	[illegible]
4. Settlement	8	[illegible]
5. Pointing	N	1
6. Erosion	8	1
7. Debris on Seats	6	M.P.
8. Slope Paving	N	1
9.		
10.		

COLLISION DAMAGE: *Please explain*
None (✓) Minor ( ) Moderate ( ) Severe ( )

UNDERMINING (Y/N) : If YES please explain N

SCOUR: *Please explain*
None (✓) Minor ( ) Moderate ( ) Severe ( )

ITEM 60 FROM U/W INSP. N

93b-U/W INSP DATE: —

OWN N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION DATE
N	4FG	B16365	MDC89630D131	7-11-97

REMARKS & PHOTOS:

WEARING SURFACE (BITUMINOUS) BREAKING UP AT JOINTS
MAP CRACKING (SOFFIT) IS PREVALENT THROUGH-OUT,
SPECIALLY AT JOINTS.
-11 ~ PARAPETS, RAILING AND LIGHTING INCORPORATED
PARAPET BREAKING UP AT ELECTRIC BOXES. RAILING
AND LIGHTING ARE MISSING AND BROKEN. LIGHTING
IS NOT ON.
-DRAINS ARE CLOGGED
CONCRETE UNDER IS HEAVILY SPALLED EXPOSED
REBAR.
EB ARE SEVERELY CORRODED WITH STRATIFIED RUST LOSS
F SECTION UP TO 20%.
ENDS OF GIRDERS (AT JOINTS) ARE SEVERELY
ORRODED
HEAVILY RUSTED
DEBRIS FROM EXPANSION JOINT.

```
: 08/12/1997                                        BOWKER ON/BCON MUDDY
```

```
State Information ******************
 List=Y
65

                        AASHTO=066.4
Identification ********************
umber                    MDC89630D131
oute                        127000013
ay Department District             04
    025    (4) Place code       07000
tersected  COMB  BEACON ST MUDDY RV
rried      US  1 SB ON RAMP
           .2 MI S OF ST RTE 2A
                              000.000
 D 20.9    (17) Longitude 071 D 05.6
ge State Code              Share    %
ge Structure No.    #
tructure Type and Material ********
pe Main: Steel
irder                        Code 302
pe Appr: Other
                             Code 000
ans in main unit                  003
proach spans                     0000
re Type                      Code   1
ace / Protective System:
ing surface                  Code   6
rane                         Code   2
 protection                  Code   0
ge and Service *******************
                                 1965
ructed                           0000
 ce: On - 2nd level
'-WW                         Code  66
ructure   02   Under Structure   03
 Traffic                       016495
     90 (109) Truck ADT         10 %
r length                        00 MI
ometric Data ********************
imum span                     0070 FT
gth                         000220 FT
alk:   Left 02.0 FT  Right 02.0 FT
y Width Curb to Curb         026.0 FT
t to Out                     032.0 FT
way Width (w/shoulders)        030 FT
                               Code 0
DEG        (35) Structure Flared 1
te MIN Vert Clear      99 FT 99 IN
te Total Horiz Clear        26.0 FT
 Over Bridge Rdwy      99 FT 99 IN
clear ref           H  00 FT 00 IN
lear RT ref         H       00.0 FT
lear LT                     00.0 FT
igation Data *******************
trol                          Code 0
n                             Code
tical Clearance               000 FT
ge Nav Min`Vert Clear             FT
izontal Clearance            0000 FT
```

```
          ********** Classification *************** Code
 (112) NBIS Bridge Length                              Y
 (104) Highway System - NHS                            1
  (26) Functional Class - Urban Arterial              14
 (100) Defense Highway                                 0
 (101) Parallel Structure                              L
 (102) Direction of Traffic                            1
 (103) Temporary Structure
 (110) Designated National Network                     0
  (20) Toll                                            3
  (21) Maintain - Other State                         21
  (22) Owner - Other State                            21
  (37) Historical Significance                         5
        ********** Condition ******************** Code
  (58) Deck                                            6
  (59) Superstructure                                  7
  (60) Substructure                                    7
  (61) Channel & Channel Protection                    8
  (62) Culverts                                        N
        ********** Load Rating and Posting ******* Code
  (31) Design Load - H 20                              4
  (64) Operating Rating - Type 3S2                   556
  (66) Inventory Rating - Type 3S2                   536
  (70) Bridge Posting                                  5
  (41) Structure - Posted for load                     P
        ********** Appraisal ********************* Code
  (67) Structural Evaluation                           5
  (68) Deck Geometry                                   3
  (69) Underclearances, vert. and horiz.               3
  (71) Waterway adequacy                               6
  (72) Approach Roadway Alignment                      5
  (36) Traffic Safety Features                      1000
 (113) Scour Critical Bridges                          6
        ********** Proposed Improvements *************
  (75) Type of Work                           Code  351
  (76) Length of Structure Improvement       000220 FT
  (94) Bridge Improvement Cost              $1,056,000
  (95) Roadway Improvement Cost               $106,000
  (96) Total Project Cost                   $1,584,000
  (97) Year of Improvement Cost Estimate            91
 (114) Future ADT                               024117
 (115) Year of Future ADT                           12
        ********** Inspections ***********************
  (90) Inspection Date  0797     (91) Frequency  24 MO
  (92) Critical Feature Inspection:      (93) CFI DATE
   (A) Fracture Critical Detail - N - 00     MO A)
   (B) Underwater Inspection    - N - 00     MO B)
   (C) Other Special Inspection - N -        MO C)
   (*) Critical Member           - N00       MO *)
   (*) In-depth Inspection       - A         MO *) A
   (*) Closed Bridge             - N.        MO *)
   (*) Damage Inspection         - N/A       MO *)
        ********** Loads ******************************
                    H20    Type 3    Type 3S2   Type HS
       Operating    135    443       556
       Inventory    122    427       536
        ********** Posting ****************************
       Status POSTED                    Date 03/16/1989
       2 Axle 122       3 Axle 427       5 Axle 536
```

D

Report date: 06/25/1997

BOWKER ON/BCON MUDDY

********** State Information ******************

FHWA Select List-Y

BDEPT#-B16365

Town-Boston

B.I.N.-4FG AASHTO-066.4

********** Identification ********************

(8) Structure Number MDC89630D131

(5) Inventory Route 127000013

(2) State Highway Department District 04

(3) County Code 025 (4) Place code 07000

(6) Features Intersected COMB BEACON ST MUDDY RV

(7) Facility Carried US 1 SB ON RAMP

(9) Location .2 MI S OF ST RTE 2A

(11) Milepoint 000.000

(16) Latitude 42 D 20.9 (17) Longitude 071 D 05.6

(98) Border Bridge State Code Share %

(99) Border Bridge Structure No. #

********** Structure Type and Material ********

(43) Structure Type Main: Steel
Stringer/Girder Code 302

(44) Structure Type Appr: Other
Other Code 000

(45) Number of spans in main unit 003

(46) Number of approach spans 0000

(107) Deck Structure Type Code 1

(108) Wearing Surface / Protective System:

A) Type of wearing surface Code 6

B) Type of membrane Code 2

C) Type of deck protection Code 0

********** Age and Service *******************

(27) Year Built 1965

(106) Year Reconstructed 0000

(42) Type of Service: On - 2nd level
Under - HWY-WW Code 66

(28) Lanes: On Structure 02 Under Structure 03

(29) Average Daily Traffic 016495

(30) Year of ADT 90 (109) Truck ADT 10 %

(19) Bypass, detour length 00 MI

********** Geometric Data ********************

(48) Length of maximum span 0070 FT

(49) Structure Length 000220 FT

(50) Curb or sidewalk: Left 02.0 FT Right 02.0 FT

(51) Bridge Roadway Width Curb to Curb 026.0 FT

(52) Deck Width Out to Out 032.0 FT

(32) Approach Roadway Width (w/shoulders) 030 FT

(33) Bridge Median Code 0

(34) Skew 05 DEG (35) Structure Flared 1

(10) Inventory Route MIN Vert Clear 99 FT 99 IN

(47) Inventory Route Total Horiz Clear 26.0 FT

(53) Min Vert Clear Over Bridge Rdwy 99 FT 99 IN

(54) Min Vert Underclear ref H 00 FT 00 IN

(55) Min Lat Underclear RT ref H 00.0 FT

(56) Min Lat Underclear LT 00.0 FT

********** Navigation Data *******************

(38) Navigation Control Code 0

(111) Pier Protection Code

(39) Navigation Vertical Clearance 000 FT

(116) Vert-lift Bridge Nav Min Vert Clear FT

(40) Navigation Horizontal Clearance 0000 FT

********** Classification *************** C

(112) NBIS Bridge Length

(104) Highway System - NHS

(26) Functional Class - Urban Arterial

(100) Defense Highway

(101) Parallel Structure

(102) Direction of Traffic

(103) Temporary Structure

(110) Designated National Network

(20) Toll

(21) Maintain - Other State

(22) Owner - Other State

(37) Historical Significance

********** Condition ******************** C

(58) Deck

(59) Superstructure

(60) Substructure

(61) Channel & Channel Protection

(62) Culverts

********** Load Rating and Posting ******* C

(31) Design Load - H 20

(64) Operating Rating - Type 3S2

(66) Inventory Rating - Type 3S2

(70) Bridge Posting

(41) Structure - Posted for load

********** Appraisal ******************** C

(67) Structural Evaluation

(68) Deck Geometry

(69) Underclearances, vert. and horiz.

(71) Waterway adequacy

(72) Approach Roadway Alignment

(36) Traffic Safety Features 1

(113) Scour Critical Bridges

********** Proposed Improvements ************

(75) Type of Work Code

(76) Length of Structure Improvement 000220

(94) Bridge Improvement Cost $1,056,

(95) Roadway Improvement Cost $106,

(96) Total Project Cost $1,584,

(97) Year of Improvement Cost Estimate

(114) Future ADT 0241

(115) Year of Future ADT

********** Inspections **********************

(90) Inspection Date ~~0795~~ 0797 (91) Frequency 24

(92) Critical Feature Inspection: (93) CFI D

(A) Fracture Critical Detail - N - 00 MO A)

(B) Underwater Inspection - N - 00 MO B)

(C) Other Special Inspection - N - MO C)

(*) Critical Member - N00 MO *)

(*) In-depth Inspection - A MO *) A

(*) Closed Bridge - N MO *)

(*) Damage Inspection - N/A MO *)

********** Loads ****************************

	H20	Type 3	Type 3S2	Type
Operating	135	443	556	
Inventory	122	427	536	

********** Posting **************************

Status POSTED Date 03/16/

2 Axle 122 3 Axle 427 5 Axle

State Information

FHWA Select List= Y

AASHTO= 067.5

Identification

MDC89630D131
127000013
artment District 04
025 (4) Place code 07000
ed COMB BEACON ST MUDDY RV
US 1 SB ON RAMP
.2 MI S OF ST RTE 2A
0000.016
twork Y
te & Subroute
42 DEG 21 MIN 00.04 SEC
71 DEG 05 MIN 33.98 SEC
e Code Share %
cture No. #

Structure Type and Material

ain: Steel Code 302
Jointless bridge type: Not applicable
pr:
Code 000
n main unit 003
ch spans 0000
ype - Concrete Cast-in-Place Code 1
/ Protective System:
surface - Bituminous Code 6
e - Preformed Fabric Code 2
tection - None Code 0

Age and Service

1965
ed 0000
1 - Overpass at Interchange
aterway Code 66
e 02 Under structure 03
fic 027000
1997 (109) Truck ADT 10 %
gth ,000 KM

Geometric Data

span 0021.3 M
00067.1 M
Left 00.6 M Right 00.6 M
dth Curb to Curb 007.9 M
Out 009.8 M
Width (w/shoulders) 009.1 M
o median Code 0
DEG (35) Structure Flared Y
l Vert Clear 99.99 M
al Horiz Clear 07.9 M
Bridge Rdwy 99.99 M
ref H 00.00 M
RT ref H 00.0 M
LT 00.0 M

Navigation Data

No navigation control on waterway Code 0
Code
Clearance 000.0 M
Min Vert Clear M
Clearance 0000.0 M

Classification

		Code
(112) NBIS Bridge Length		Y
(104) Highway System		Y
(26) Functional Class -	Urban Arterial	14
(100) Defense Highway		0
(101) Parallel Structure		L
(102) Direction of Traffic -	1-way traffic	1
(103) Temporary Structure		N
(105) Federal Lands Highways		0
(110) Designated National Network		N
(20) Toll -	On free road	3
(21) Maintain -	Other State Agencies	21
(22) Owner -	Other State Agencies	21
(37) Historical Significance	built after 1949 presumed to be not	Z

Condition

	Code
(58) Deck	6
(59) Superstructure	7
(60) Substructure	7
(61) Channel & Channel Protection	8
(62) Culverts	N

Load Rating and Posting

		Code
(31) Design Load -	H 20	4
(63) Operating Rating Method	Allowable Stress (AS)	2
(64) Operating Rating		35.6
(65) Inventory Rating Method -	Allowable Stress (AS)	2
(66) Inventory Rating		22.9
(70) Bridge Posting		5
(41) Structure -	Posted for load	P

Appraisal

	Code
(67) Structural Evaluation	5
(68) Deck Geometry	2
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	6
(72) Approach Roadway Alignment	5
(36) Traffic Safety Features	1 0 0 0
(113) Scour Critical Bridges	6

Inspections

(90) Inspection Date 07/21/99 (91) Frequency 24 MO

(92) Critical Feature Inspection:				(93) CFI DATE
(A) Fracture Critical Detail	N	00	MO A)	00/00/00
(B) Underwater Inspection	Y	36	MO B)	12/22/97
(C) Other Special Inspection	N	00	MO C)	00/00/00
(*) Other Inspection	N	00	MO *)	00/00/00
(*) Closed Bridge	N	00	MO *)	00/00/00
(*) Damage Inspection			MO *)	00/00/00

Loads

Date 00/00/00	H20	Type 3	Type 3S2	Type HS
Operating	35	43	56	00
Inventory	22	27	36	00

Posting

Status POSTED Date 03/16/89
2 Axle 22 3 Axle 27 5 Axle 36

Misc.

Bridge Name BOWKER ON/BCON MUDDY

N Anti-missile fence N Acrow Panel N Jointless Bridge

Accessibility

N	Liftbucket	N	Rigging	Inspection
N	Ladder	N	Staging	Hours: 06
N	Boat	N	Traffic Control	
N	Wader	N	RR Flagperson	
N	Inspector 50	N	Police	

ct

MASSACHUSETTS HIGHWAY DEPARTMENT

UNDERWATER OPERATIONS TEAM

DIVERS ACTIVITY REPORT

bridge dept. no.
B-16-365

vn ON	5-facility carried US 1 NB OFF RAMP	6-features intersected MUDDY RIVER, MBTA SUB	93b-date inspected 12/22/97
8-structure no. MDC 896 30A 111	foundation type	dive master R. BONICA	
n level	access to bridge EMBANKMENT	team members J. FITZGERALD, J. DONAHUE, B. SULLIVAN	
nditions AVEL, BOULDERS, MUD	water conditions HIGH BACTERIA POLLUTION	depth 2.5 m +/-	visibility 1 m +/-
current NIL "			

m 60 (Underwater) **7**

structure

butments

Wings	NA
Breastwall	NA
Pointing	NA
Footings	NA
Piles	NA
Scour	NA
Undermining	NA
Settlement	NA
	NA
	NA

ers or Bents

item	7
ointing	NA
olumn	NA
ooting	NA
iles	NA
cour	NA
ndermining	NO
ettlement	8
	NA

Bents

oncrete Piles	NA
mber Piles	NA
agonal Bracing	NA
rizontal Bracing	NA
steners	NA
	NA

dermining rated as YES or NO

4. Fender System

a.) Piles	NA
b.) Diagonal Bracing	NA
c.) Horizontal Bracing	NA
d.) Wales	NA
e.) Fasteners	NA
f.) Ladders	NA
g.)	NA
h.)	NA

Item 61 (Underwater) **7**

Channel and Channel Protection

1. Debris	7
2. Aggradation	7
3. Utilities	X
4. Rip Rap	NA
5.	NA
6.	NA

Item 113 **Scour Critical Bridges**

Scour

a.) Footing Exposed	Y
b.) Undermining	N

Scour Countermeasures

a.) Sheeting	N
b.) Rip Rap	N
c.) Other	N

Y=YES N=NO

Submitted by: R. B

KNOWN NA=NOT APPLICABLE IA=INACCESSIBLE

FILE

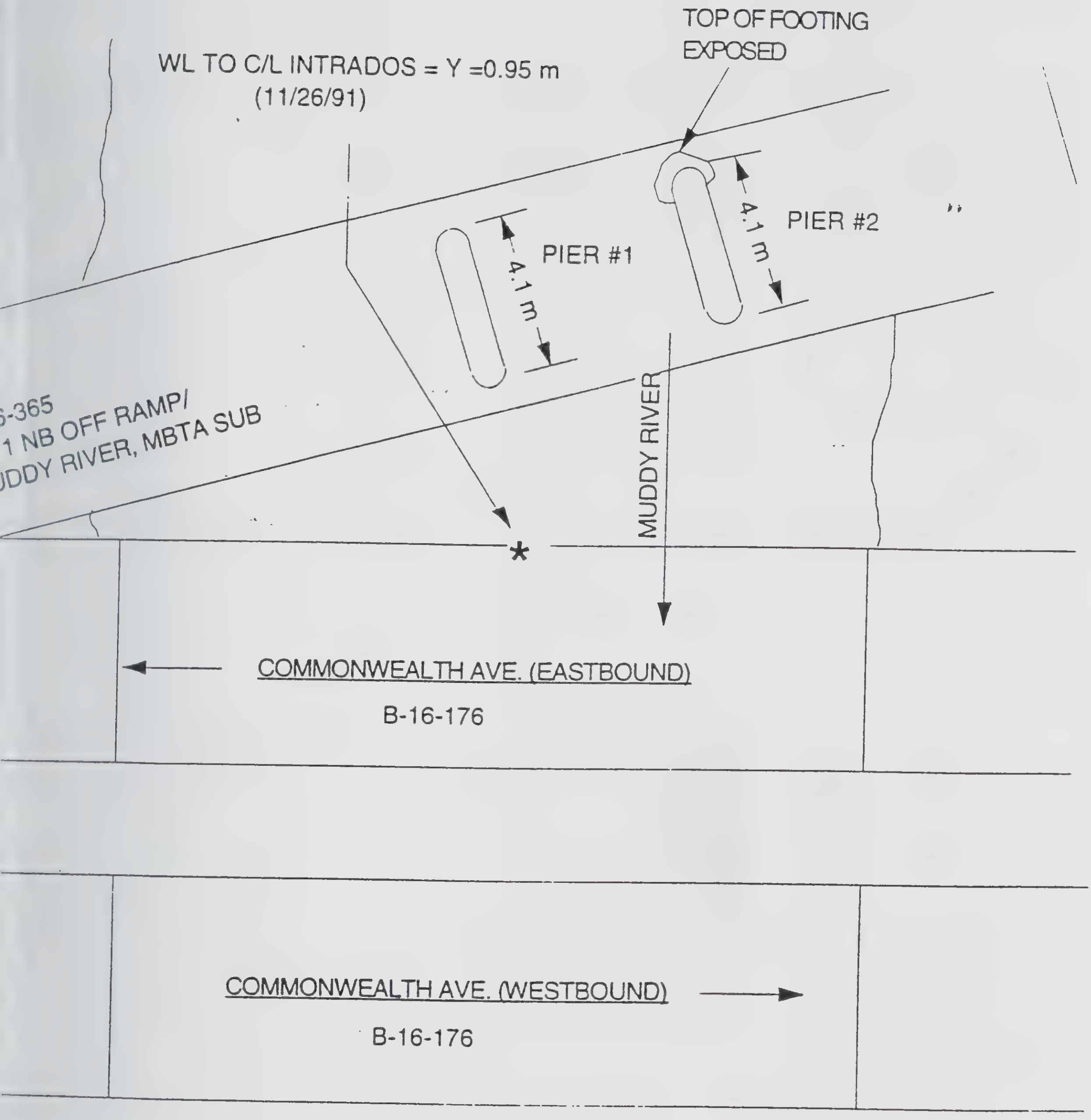
CITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTIO
BOSTON	4FD	B-16-365	MDC 896 30A 111	Decemb

REMARKS & PHOTOS

This structure carries US 1 NB Off Ramp over the Muddy River and the MBTA subway. T
elements consist of two piers located upstream of Commonwealth Ave. (See Plan View)
Concrete pier stems have minor abrasion with coarse aggregate exposed at the waterline, 0.5

Pier No. 1:
Footing is covered, no undermining.

Pier No. 2:
Top of footing is exposed at upstream end, no undermining. See Sketch



PLAN VIEW
(NTS)

SCOUR MONITORING CHART

	11/26/91	12/10/94	12/22/97
PIER #1			
UPSTREAM END	0.6 m	0.4 m	0.5 m
LEFT SIDE	1.9 m	1.9 m	2.1 m
DOWNSTREAM END	2.3 m	2.2 m	2.3 m
RIGHT SIDE	0.9 m	1.1 m	1.1 m
PIER #2			
UPSTREAM END (ON FTG.)	2.5 m	2.5 m	2.5 m
LEFT SIDE	2.0 m	1.9 m	2.0 m
DOWNSTREAM END	1.3 m	1.3 m	1.4 m
RIGHT SIDE	1.9 m	1.8 m	2.0 m
Y	0.95 m	1.01 m	1.1 m
CORRECTION FACTOR	- - -	+0.06 m	+0.15 m

NOTES:

1. ALL MEASUREMENTS ARE IN METRIC.

2. WATERLINE TO C/L INTRADOS, UPSTREAM END, COMMONWEALTH AVE. EA
BRIDGE = Y = 0.95 m (11/26/91)

xtremely high'

nan

ich runs
ine from
es River,
levels of
rene and
boratory

bacteria
nes high-
s in Bos-
in the re-
environ-

mental group that commissioned the tests.

"Even one drop of water as contaminated as this is dangerous to people with low immune systems, children or HIV-positive people," said Irene Gillis, chairwoman of Restore Olmsted's Waterway. Speaking at a conference on the Muddy River held at Harvard's School of Public Health yesterday, she and other activists warned residents not to swim in the water, eat fish caught there or even touch the water.

MUDDY, Page B4

obe 11/17/96

show high pollution

■ MUDDY
Continued from Page B1

"Even if your dog runs through this water and you pet him, he can bring waterborne disease into your home," Gillis said.

Restore Olmsted's Waterway is a citizens' group dedicated to cleaning up the Muddy River, the 3½-mile waterway that snakes through the Emerald Necklace of parks and green space designed 100 years ago by Frederick Law Olmsted.

The group's decade-long fight over the Muddy took on renewed importance in the last few weeks when the reed-choked and sewage-contaminated river flooded into residential basements and subway stations. The river has flooded twice in the last two months and polluted water from the Muddy flows into the Charles River.

Former Gov. Michael S. Dukakis, in an interview at the conference, faulted his successor in the State House for not taking leadership in stopping pollution of a riverway that passes close to the homes of thousands of Boston and Brookline residents.

"This is a state responsibility, and you know who should be here? The guy in the governor's office. It's one thing to say you care about the environment, and it's another to put your money where your mouth is," Dukakis said of Gov. William F. Weld.

"If he had taken a dive in [the Muddy River] at Charlesgate, he'd never have come up," Dukakis said in a mocking reference to Weld's much-hyped splash into the Charles River after signing a rivers protection bill.

But Weld's spokesman, Bob Bliss, expressed disbelief that Dukakis would wag a finger at Weld.

"I'm surprised that Gov. Dukakis, who was a few days late and a couple of hundred million dollars short in cleaning up Boston Harbor, would be criticizing anyone on an environmental cleanup," Bliss said.

Rick Lombardi, a spokesman for the state Executive Office of Environmental Affairs, insisted that Weld "has taken the initiative" to clean up the river. "We have appointed a mediator to work with a multitude of groups, the city of Boston, Massachusetts Water Resources Authority and the Army Corps of Engineers to try to bring a plan into action," he said.

Samples taken last month from sediment at the base of the Netherlands Road bridge in Brookline, near the town's water and sewer works, found 63,000 colonies per gram of clostridium perfringens bacteria, which can cause gas gangrene and gastrointestinal disorders, according to Fred Youngs, director of the Citizens' Environmental Laboratory in Cambridge. That is 21 times higher than the levels recorded at sewage outfalls in the harbor, he said.

The clostridium signals the presence of other pathogens or disease-bearing organisms such as hepatitis A, staphylococcus and salmonella, Youngs said.

The tests also found elevated levels of the waterborne pathogen enterococcus. In one spot, the bacteria was measured at 5 ½ times the level permitted by Environmental Protection Agency guidelines.

Youngs noted that the levels of fecal coliform – which indicates the presence of raw human sewage in water – measured in the Muddy in a 1992 study by the Army Corps of Engineers was in some cases between 1,000 and 2,500 times higher than EPA guidelines, outstripping the levels in the Charles River that caused alarm a few months ago.

Documents obtained recently indicate that in 1992, when the dangerously elevated levels of fecal coliform were found in the Muddy River, federal officials rejected as too costly plans to improve flood control along the river.

But damage and cleanup costs for the MBTA from last month's flooding – which forced the closing of the Kenmore Square station for several days and disrupted service for 200,000 riders – is expected to run between $15 and $20 million, calling into question the Army Corps of Engineers' recommendation rejecting flood control four years ago.

Cathleen Douglas Stone, environmental services director for the city of Boston, said Mayor Thomas M. Menino has a commitment to preserving open space in the city, and is studying ways to limit pollution of the Muddy, from reducing or eliminating discharge into the river to keeping Boston streets cleaner so garbage won't blow into the river.

Dr. Alan Balsam, director of Brookline's Public Health Department, warned that people should be cautious about recreational activity near the Muddy.

But Balsam added that Brookline aims within the next year and a half to fix all 39 improper sewer hookups or discharges that are polluting the Muddy with sewage.

PAGE 5 OF 5

Element Data Collection Form

Month	Day	Year
12	22	97

Bridge Number B-16-365

Town BOSTON

BIN 4FD

District 4

Bridge Key Number MDC 896 30A 111

Inspectors BONICA — Leader; FITZGERALD, DONAHUE, SULLIVAN — Member; U/W OPNS — Agency/Consultant/Dept. Name

ent	Units	Env-iron.	Total Quantity	Condition States (Quantity or Percent) * 1	2	3	4	5	Q or P *
VALL	M	2	8.2	8.2					Q
MERGED FOOTING	EA	2	2	1 *					Q
LY TOP OF FOOTING VISIBLE, PIER #2, UPSTREAM END									

ch between Quantity and Percent for different Elements.

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

B-16-365

PAGE 1 OF 3

BR. DEPT. NO. ~~6-2097~~

ON	8-STRUCTURES NO. MDC 89630A 111	11-MILE POINT 000.010	41-STATUS A	90-ROUTINE INSP DATE 6-19-97
ED B. OFF RAMP	MEMORIAL NAME/LOCAL NAME Bowker	27-YR BUILT 1965	106-YR REBUILT —	YR REHAB'D (NON 106) —
RSECTED RIVER MBTA SUB.	26-FUNCTIONAL CLASS. URBAN ART.	DIST. BRIDGE INSPECTION ENGINEER David Lenhardt		CONSULTANT'S STAMP:
PE L GIRDER	22-OWNER MDC	21-MAINTAINER MDC	TEAM LEADER R.E. Carr	
Concrete	WEATHER Sunny	TEMP(a) 80s	TEMP(c) -	TEAM MEMBERS J. DAVISON

6		DEF
ace	6	
on	6	
forms	N	
	7	
	N	
	7	
	5	
	5	
ence	8	
stem	5	
ndards	2	
	7	
	5	

/E 8

—

		DEF
ondition	7	1
ettlement	8	1
ettlement	7	1

GNS (Y/N) Y

		DEF
ls	N	1
s	7	1
s	7	1

ITEM 59

SUPERSTRUCTURE 6

		DEF
1. Stringers	N	
2. Floorbeams	6	
3. Floor System Bracing	N	
4. Girders or Beams	7	
5. Trusses - General	N	
a. Upper Chords	N	
b. Lower Chords	N	
c. Web Members	N	
d. Lateral Bracings	N	
e. Sway Bracings	N	
f. Portals	N	
g. End Posts	N	
6. Pin & Hangers	N	
7. Conn Plt's, Gussets & Angles	N	
8. Cover Plates	7	
9. Bearing Devices	5	
10. Diaphragms/Cross Frames	7	
11. Rivets & Bolts	5	
12. Welds	7	
13. Member Alignment	7	
14. Paint/Coating	5	
15.		
Year Painted:		

COLLISION DAMAGE: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

LOAD DEFLECTION: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

LOAD VIBRATION: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

Any Fracture Critical Member : (Y/N) Y

Any Cracks : (Y/N) N

ITEM 60

SUBSTRUCTURE 7

		DEF
1. Abutments	7	▨
a. Wingwalls	7	1
b. Backwalls	7	1
c. Breastwalls	7	1
d. Bridge Seats +	7	1
e. Pedestals	7	1
f. Footings	H	1
g. Piles	H	1
2. Piers or ~~Bents~~	7	▨
a. Caps	6	1
b. Pedestals	7	1
c. Columns	N	1
d. Webs	7	1
e. Footings	H	1
f. Piles	H	1
3. Pile Bents	N	▨
a. Piles	N	1
b. Diagonal Bracing	N	1
c. Horizontal Bracing	N	1
d. Fasteners	N	1
4. Settlement	8	1
5. Pointing	N	1
6. Erosion	7	1
7. Debris on Seats *	6	1
8. Slope Paving	7	1
9.		
10.		

COLLISION DAMAGE: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

UNDERMINING (Y/N) : If YES please explain N

SCOUR: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

ITEM 60 FROM U/W INSP. 7

93b-U/W INSP DATE: 12 94

DWN N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

N	B.I.N. 4FD	BR. DEPT. NO. B16-365	8-STRUCTURE NO. MDC P96 30A 111	INSPECTION DATE 6-20-97

REMARKS & PHOTOS

iT Conc. Surface Break up around sealed Joints.
Conc. @ Joints under Breaking up. Spalled
m Piers
Slight Collision Damage To: Curb (Plow) East Only.
Concrete parapet Break up at Electric Hand Holes.
s:)
Rail-Lighting - incorporated. many" Sections.
G.
Drains are Full of Debris. Not Functioning
None Functional -.
Joints Paved over - Breaking up at Surface
g on F.B. and Girder Beams.
Severe Rust Slight Loss of Section @ Pier #4
Severe Rust Bearing are Frozen @ all Piers.
Two Vertical Cracks North Wall Slight Exudation.
Pier #1 Heavy Spalling under Cap East Side
tal Crack along Top Same. Exposed Rebar
rea.
lled Conc. on Piers Heavy.

```
tate Information ****************         ********** Classification *************** Code
List=Y                                (112) NBIS Bridge Length                          Y
S                                     (104) Highway System - NHS                        1
                                       (26) Functional Class - Urban Arterial          14
                    AASHTO=071.4      (100) Defense Highway                             0
dentification *******************     (101) Parallel Structure                          R
mber                   MDC89630A111   (102) Direction of Traffic                        1
ute                       127000001   (103) Temporary Structure
y Department District            04   (110) Designated National Network                 0
    025     (4) Place code    07000    (20) Toll                                        3
ersected  WATER MUDDY RIV MBTA SUB     (21) Maintain - Other State                     21
ried      US  1 NB OFF RAMP            (22) Owner - Other State                        21
          .2 MI S OF ST RTE 2A         (37) Historical Significance                     Z
                            000.000         ********** Condition ******************** Code
D 20.9    (17) Longitude 071 D 05.6    (58) Deck                                        6
e State Code             Share    %    (59) Superstructure                              6
e Structure No.    #                   (60) Substructure                                7
tructure Type and Material ********    (61) Channel & Channel Protection                7
pe Main: Steel                         (62) Culverts                                    N
loorbeam                   Code 303         ********** Load Rating and Posting ******* Code
pe Appr: Other                         (31) Design Load - H 20                          4
                           Code 000    (64) Operating Rating - Type 3S2               556
ans in main unit                004    (66) Inventory Rating - Type 3S2               536
proach spans                   0000    (70) Bridge Posting                              5
re Type                    Code   1    (41) Structure - Open                            A
ace / Protective System:                    ********** Appraisal ******************** Code
.ng surface                Code   6    (67) Structural Evaluation                       5
rane                       Code   2    (68) Deck Geometry                               2
 protection                Code   0    (69) Underclearances, vert. and horiz.           N
ge and Service *******************     (71) Waterway adequacy                           7
                               1965    (72) Approach Roadway Alignment                  5
ucted                          0000    (36) Traffic Safety Features                  1010
.ce: On - 2nd level                   (113) Scour Critical Bridges                      6
.erway                     Code  65         ********** Proposed Improvements *************
.ructure   02   Under Structure  00    (75) Type of Work                      Code   351
' Traffic                    006578    (76) Length of Structure Improvement     000286 FT
     93 (109) Truck ADT           %    (94) Bridge Improvement Cost            $1,501,000
r length                      00 MI    (95) Roadway Improvement Cost             $150,000
ometric Data ********************      (96) Total Project Cost                 $2,252,000
imum span                   0070 FT    (97) Year of Improvement Cost Estimate          91
gth                       000286 FT   (114) Future ADT                             009472
alk:   Left 00.5 FT  Right 02.0 FT    (115) Year of Future ADT                         12
y Width Curb to Curb       024.0 FT         ********** Inspections **********************
t to Out                   035.0 FT    (90) Inspection Date  0697    (91) Frequency  24 MO
way Width (w/shoulders)      036 FT    (92) Critical Feature Inspection:      (93) CFI DATE
                             Code 0     (A) Fracture Critical Detail - N - 00    MO A)
DEG        (35) Structure Flared 0      (B) Underwater Inspection    - Y - 36    MO B) 1294
te MIN Vert Clear      99 FT 99 IN      (C) Other Special Inspection - N -       MO C)
te Total Horiz Clear        24.0 FT     (*) Critical Member          - N00       MO *)
r Over Bridge Rdwy     99 FT 99 IN      (*) In-depth Inspection      - A         MO *) A
rclear ref         N   00 FT 00 IN      (*) Closed Bridge            - N         MO *)
clear RT ref       N        99.9 FT     (*) Damage Inspection        - N/A       MO *)
clear LT                    00.0 FT         ********** Loads *****************************
vigation Data *******************                     H20    Type 3    Type 3S2   Type HS
ntrol                        Code 0         Operating  135    443       556
on                           Code           Inventory  122    427       536
rtical Clearance             000 FT         ********** Posting ***************************
dge Nav Min Vert Clear           FT         Status LEGAL                   Date 00/00/0000
rizontal Clearance          0000 FT         2 Axle          3 Axle          5 Axle
```

Report date: 05/30/1997

BOWKER NB OFF RAMP

D

********** State Information ******************
FHWA Select List=Y
BDEPT#=B16365
Town=Boston
B.I.N.=4FD AASHTO=071.4

********** Identification ********************
(8) Structure Number MDC89630A111
(5) Inventory Route 127000001
(2) State Highway Department District 04
(3) County Code 025 (4) Place code 07000
(6) Features Intersected WATER MUDDY RIV MBTA SUB
(7) Facility Carried US 1 NB OFF RAMP
(9) Location .2 MI S OF ST RTE 2A
(11) Milepoint 000.000
(16) Latitude 42 D 20.9 (17) Longitude 071 D 05.6
(98) Border Bridge State Code Share %
(99) Border Bridge Structure No. #

********** Structure Type and Material ********
(43) Structure Type Main: Steel
Girder & Floorbeam Code 303
(44) Structure Type Appr: Other
Other Code 000
(45) Number of spans in main unit 004
(46) Number of approach spans 0000
(107) Deck Structure Type Code 1
(108) Wearing Surface / Protective System:
A) Type of wearing surface Code 6
B) Type of membrane Code 2
C) Type of deck protection Code 0

********** Age and Service ********************
(27) Year Built 1965
(106) Year Reconstructed 0000
(42) Type of Service: On - 2nd level
Under - Waterway Code 65
(28) Lanes: On Structure 02 Under Structure 00
(29) Average Daily Traffic 006578
(30) Year of ADT 93 (109) Truck ADT %
(19) Bypass, detour length 00 MI

********** Geometric Data ********************
(48) Length of maximum span 0070 FT
(49) Structure Length 000286 FT
(50) Curb or sidewalk: Left 00.5 FT Right 02.0 FT
(51) Bridge Roadway Width Curb to Curb 024.0 FT
(52) Deck Width Out to Out 035.0 FT
(32) Approach Roadway Width (w/shoulders) 036 FT
(33) Bridge Median Code 0
(34) Skew 00 DEG (35) Structure Flared 0
(10) Inventory Route MIN Vert Clear 99 FT 99 IN
(47) Inventory Route Total Horiz Clear 24.0 FT
(53) Min Vert Clear Over Bridge Rdwy 99 FT 99 IN
(54) Min Vert Underclear ref N 00 FT 00 IN
(55) Min Lat Underclear RT ref N 99.9 FT
(56) Min Lat Underclear LT 00.0 FT

********** Navigation Data ********************
(38) Navigation Control Code 0
(111) Pier Protection Code
(39) Navigation Vertical Clearance 000 FT
(116) Vert-lift Bridge Nav Min Vert Clear FT
(40) Navigation Horizontal Clearance 0000 FT

********** Classification **************** Co
(112) NBIS Bridge Length
(104) Highway System - NHS
(26) Functional Class - Urban Arterial
(100) Defense Highway
(101) Parallel Structure
(102) Direction of Traffic
(103) Temporary Structure
(110) Designated National Network
(20) Toll
(21) Maintain - Other State
(22) Owner - Other State
(37) Historical Significance

********** Condition ********************** Coc
(58) Deck 4
(59) Superstructure
(60) Substructure
(61) Channel & Channel Protection
(62) Culverts

********** Load Rating and Posting ******* Cod
(31) Design Load - H 20
(64) Operating Rating - Type 3S2 55
(66) Inventory Rating - Type 3S2 53
(70) Bridge Posting
(41) Structure - Open

********** Appraisal ********************* Cod
(67) Structural Evaluation
(68) Deck Geometry
(69) Underclearances, vert. and horiz.
(71) Waterway adequacy
(72) Approach Roadway Alignment
(36) Traffic Safety Features 101
(113) Scour Critical Bridges

********** Proposed Improvements **************
(75) Type of Work Code 351
(76) Length of Structure Improvement 000286 F
(94) Bridge Improvement Cost $1,501,000
(95) Roadway Improvement Cost $150,000
(96) Total Project Cost $2,252,000
(97) Year of Improvement Cost Estimate 91
(114) Future ADT 009472
(115) Year of Future ADT 12

8/97

********** Inspectio[illegible] ***********************
(90) Inspection Date [illegible] (91) Frequency 24 MO
(92) Critical Feature Inspection: (93) CFI DATE
(A) Fracture Critical Detail - N - 00 MO A)
(B) Underwater Inspection - Y - 36 MO B) 1294
(C) Other Special Inspection - N - MO C)
(*) Critical Member - N00 MO *)
(*) In-depth Inspection - A MO *) A
(*) Closed Bridge - N MO *)
(*) Damage Inspection - N/A MO *)

********** Loads ********************************

	H20	Type 3	Type 3S2	Type HS
Operating	135	443	556	
Inventory	122	427	536	

********** Posting ******************************
Status LEGAL Date 00/00/000
2 Axle 3 Axle 5 Axle

State Information

FHWA Select List= N

AASHTO= 028.0

Identification

BRI896008000

partment District 04

025 (4) Place code 07000

ed WATER MUDDY RIVER

US 1 JAMAICAWAY

0000.000

twork N

ute & Subroute

00 DEG 00 MIN 00.00 SEC

00 DEG 00 MIN 00.00 SEC

te Code Share %

ucture No. #

Structure Type and Material

ain: Code ???

Jointless bridge type:

ppr:

Code ???

in main unit 000

ch spans 0000

Type - Code ?

/ Protective System:

surface - Code ?

ne - Code ?

otection - Code ?

Age and Service

1850

cted 1900

n -

Code

re 00 Under structure 00

affic 000000

2000 (109) Truck ADT 00 %

ngth 000 KM

Geometric Data

m span 0000.0 M

00004.6 M

Left 00.0 M Right 00.0 M

idth Curb to Curb 000.0 M

Out 000.0 M

y Width (w/shoulders) 000.0 M

Code ?

DEG (35) Structure Flared N

IN Vert Clear 00.00 M

otal Horiz Clear 00.0 M

r Bridge Rdwy 00.00 M

ar ref N 00.00 M

RT ref N 00.0 M

r LT 00.0 M

Navigation Data

- Code ?

Code ?

Clearance 000.0 M

av Min Vert Clear M

tal Clearance 0000.0 M

Classification	Code
(112) NBIS Bridge Length	N
(104) Highway System	N
(26) Functional Class -	
(100) Defense Highway	1
(101) Parallel Structure	?
(102) Direction of Traffic -	?
(103) Temporary Structure	N
(105) Federal Lands Highways	0
(110) Designated National Network	N
(20) Toll -	
(21) Maintain -	
(22) Owner -	
(37) Historical Significance undetermined	

Condition	Code
(58) Deck	?
(59) Superstructure	?
(60) Substructure	?
(61) Channel & Channel Protection	?
(62) Culverts	?

Load Rating and Posting	Code
(31) Design Load -	?
(63) Operating Rating Method Allowable Stress (AS)	2
(64) Operating Rating	00.0
(65) Inventory Rating Method - Allowable Stress (AS)	2
(66) Inventory Rating	00.0
(70) Bridge Posting	0
(41) Structure -	

Appraisal	Code
(67) Structural Evaluation	N
(68) Deck Geometry	N
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	
(72) Approach Roadway Alignment	
(36) Traffic Safety Features	
(113) Scour Critical Bridges	6

Inspections

(90) Inspection Date 00/00/00 (91) Frequency 24 MO

(92) Critical Feature Inspection:				(93) CFI DATE
(A) Fracture Critical Detail	N	00	MO A)	00/00/00
(B) Underwater Inspection	N	00	MO B)	00/00/00
(C) Other Special Inspection	N	00	MO C)	00/00/00
(*) Other Inspection	N	00	MO *)	00/00/00
(*) Closed Bridge	N	00	MO *)	00/00/00
(*) Damage Inspection			MO *)	00/00/00

Loads

Date 00/00/00	H20	Type 3	Type 3S2	Type HS
Operating	00	00	00	00
Inventory	00	00	00	00

Posting

Status Date 00/00/00

2 Axle 3 Axle 5 Axle

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel N Jointless Bridge

Accessibility

N Liftbucket N Rigging Inspection

N Ladder N Staging Hours: 06

N Boat N Traffic Control

N Wader N RR Flagperson

N Inspector 50 N Police

Report Date: June 6, 2000

State Information

BDEPT#=B16195 FHWA Select List= N

Town=Boston

B.I.N=8QU AASHTO= 040.0

Identification

(8) Structure Number CUL896195100

(5) Inventory Route

(2) State Highway Department District 04

(3) County Code 025 (4) Place code 07000

(6) Features Intersected WATER MUDDY RIVER

(7) Facility Carried HWY WILLOW PND R

(9) Location

(11) Kilometerpoint 0000.016

(12) Base Highway Network N

(13) LRS Inventory Route & Subroute

(16) Latitude 42 DEG 19 MIN 30.00 SEC

(17) Longitude 71 DEG 07 MIN 06.00 SEC

(98) Border Bridge State Code Share %

(99) Border Bridge Structure No. #

Structure Type and Material

(43) Structure Type Main: Masonry Code 819

Culvert Jointless bridge type:

(44) Structure Type Appr:

Other Code 000

(45) Number of spans in main unit 001

(46) Number of approach spans 0000

(107) Deck Structure Type - Code ?

(108) Wearing Surface / Protective System:

A) Type of wearing surface - Bituminous Code 6

B) Type of membrane - None Code 0

C) Type of deck protection - None Code 0

Age and Service

(27) Year Built 1850

(106) Year Reconstructed 0000

(42) Type of Service: On - Highway

Under - Waterway Code 15

(28) Lanes: On Structure 02 Under structure 00

(29) Average Daily Traffic 000000

(30) Year of ADT 2000 (109) Truck ADT 00 %

(19) Bypass, detour length 002 KM

Geometric Data

(48) Length of maximum span 0001.2 M

(49) Structure Length 00006.1 M

(50) Curb or sidewalk: Left 00.0 M Right 00.0 M

(51) Bridge Roadway Width Curb to Curb 000.0 M

(52) Deck Width Out to Out 000.0 M

(32) Approach Roadway Width (w/shoulders) 000.0 M

(33) Bridge Median - No median Code 0

(34) Skew 00 DEG (35) Structure Flared Y

(10) Inventory Route MIN Vert Clear 99.99 M

(47) Inventory Route Total Horiz Clear 00.0 M

(53) Min Vert Clear Over Bridge Rdwy 99.99 M

(54) Min Vert Underclear ref N 00.00 M

(55) Min Lat Underclear RT ref N 00.0 M

(56) Min Lat Underclear LT 00.0 M

Navigation Data

(38) Navigation Control - No navigation control on waterway Code 0

(111) Pier Protection Code

(39) Navigation Vertical Clearance 000.0 M

(116) Vert-lift Bridge Nav Min Vert Clear M

(40) Navigation Horizontal Clearance 0000.0 M

Classification

(112) NBIS Bridge Length

(104) Highway System

(26) Functional Class - Urban Local

(100) Defense Highway

(101) Parallel Structure

(102) Direction of Traffic -

(103) Temporary Structure

(105) Federal Lands Highways

(110) Designated National Network

(20) Toll - On free road

(21) Maintain - Town Agency

(22) Owner - Town Agency

(37) Historical Significance undetermined

Condition

(58) Deck

(59) Superstructure

(60) Substructure

(61) Channel & Channel Protection

(62) Culverts

Load Rating and Posting

(31) Design Load - Other/Unknown

(63) Operating Rating Method Allowable Stress (AS)

(64) Operating Rating

(65) Inventory Rating Method - Allowable Stress (AS)

(66) Inventory Rating

(70) Bridge Posting

(41) Structure - Open

Appraisal

(67) Structural Evaluation

(68) Deck Geometry

(69) Underclearances, vert. and horiz.

(71) Waterway adequacy

(72) Approach Roadway Alignment

(36) Traffic Safety Features

(113) Scour Critical Bridges

Inspections

(90) Inspection Date 09/01/84 (91) Fr

(92) Critical Feature Inspection:

(A) Fracture Critical Detail N 00 N

(B) Underwater Inspection N 00 N

(C) Other Special Inspection N 00 N

(*) Other Inspection N 00 N

(*) Closed Bridge N 00 N

(*) Damage Inspection N

Loads

Date 00/00/00	H20	Type 3	Type
Operating	00	00	
Inventory	00	00	

Posting

Status D

2 Axle 3 Axle

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel N

Accessibility

N Liftbucket N Rigging

N Ladder N Staging

N Boat N Traffic Control

N Wader N RR Flagperson

N Inspector 50 N Police

: June 6, 2000 BOWKER NB OFF RAMP

State Information

365	FHWA Select List= Y
	AASHTO= 066.5

Identification

mber	MDC89630A111
ute	127000001
y Department District	04
025 (4) Place code	07000
rsected	WATER MUDDY RIV MBTA SUB
ed	US 1 NB OFF RAMP
	.2 MI S OF ST RTE 2A
int	0000.016
ay Network	Y
y Route & Subroute	
	42 DEG 20 MIN 49.20 SEC
	71 DEG 05 MIN 35.68 SEC
e State Code	Share %
e Structure No. #	

Structure Type and Material

pe Main: Steel	Code 303
m	Jointless bridge type: Not applicable
pe Appr:	
	Code 000
ans in main unit	004
proach spans	0000
ure Type - Concrete Cast-in-Place	Code 1
rface / Protective System:	
aring surface - Bituminous	Code 6
nbrane - Preformed Fabric	Code 2
k protection - None	Code 0

Age and Service

	1965
structed	0000
ce: On - Overpass at Interchange	
aterway	Code 65
ructure 02	Under structure 00
y Traffic	027000
1997 (109) Truck ADT	00 %
ur length	000 KM

Geometric Data

ximum span	0021.3 M
ngth	00087.2 M
valk: Left 00.2 M	Right 00.6 M
ay Width Curb to Curb	007.3 M
ut to Out	010.7 M
adway Width (w/shoulders)	011.0 M
- No median	Code 0
00 DEG (35) Structure Flared	N
te MIN Vert Clear	99.99 M
te Total Horiz Clear	07.3 M
Over Bridge Rdwy	99.99 M
erclear ref N	00.00 M
clear RT ref N	00.0 M
clear LT	00.0 M

Navigation Data

ntrol - No navigation control on waterway	Code 0
on	Code
rtical Clearance	000.0 M
e Nav Min Vert Clear	M
rizontal Clearance	0000.0 M

Classification

		Code
(112) NBIS Bridge Length		Y
(104) Highway System		Y
(26) Functional Class -	Urban Arterial	14
(100) Defense Highway		0
(101) Parallel Structure		R
(102) Direction of Traffic -	1-way traffic	1
(103) Temporary Structure		N
(105) Federal Lands Highways		0
(110) Designated National Network		N
(20) Toll -	On free road	3
(21) Maintain -	Other State Agencies	21
(22) Owner -	Other State Agencies	21
(37) Historical Significance	built after 1949 presumed to be not	Z

Condition

	Code
(58) Deck	5
(59) Superstructure	6
(60) Substructure	7
(61) Channel & Channel Protection	7
(62) Culverts	N

Load Rating and Posting

		Code
(31) Design Load -	H 20	4
(63) Operating Rating Method	Allowable Stress (AS)	2
(64) Operating Rating		35.6
(65) Inventory Rating Method -	Allowable Stress (AS)	2
(66) Inventory Rating		22.9
(70) Bridge Posting		5
(41) Structure -	Open	A

Appraisal

	Code
(67) Structural Evaluation	5
(68) Deck Geometry	2
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	7
(72) Approach Roadway Alignment	5
(36) Traffic Safety Features	1 0 0 0
(113) Scour Critical Bridges	6

Inspections

(90) Inspection Date 06/04/99 (91) Frequency 24 MO

(92) Critical Feature Inspection:				(93) CFI DATE
(A) Fracture Critical Detail	N	00	MO A)	00/00/00
(B) Underwater Inspection	Y	36	MO B)	12/01/97
(C) Other Special Inspection	N	00	MO C)	00/00/00
(*) Other Inspection	N	00	MO *)	00/00/00
(*) Closed Bridge	N	00	MO *)	00/00/00
(*) Damage Inspection			MO *)	00/00/00

Loads

Date 00/00/00	H20	Type 3	Type 3S2	Type HS
Operating	35	43	56	00
Inventory	22	27	36	00

Posting

Status LEGAL Date 00/00/00

2 Axle 3 Axle 5 Axle

Misc.

Bridge Name BOWKER NB OFF RAMP

N Anti-missile fence N Acrow Panel N Jointless Bridge

Accessibility

N Liftbucket	N Rigging	Inspection
N Ladder	N Staging	Hours: 06
N Boat	N Traffic Control	
N Wader	N RR Flagperson	
N Inspector 50	N Police	

Element Data Collection Form

Month	Day	Yea
12	22	97

Bridge Number B-16-365

BIN 4FG

Bridge Key Number MDC 896 30D 131

Town BOSTON

District MDC

Inspectors BONICA | DONAHUE, FITZGERALD, SULLIVAN | U/W OPNS

Leader | Member | Agency/Consultant/Dept. Name

nent e	Units	Env- iron.	Total Quantity	Condition States (Quantity or Percent) *					Q or P *
				1	2	3	4	5	
WALL	M	2	11.5	11.5					Q
MERGED FOOTING	EA	2	1	1					Q

itch between Quantity and Percent for different Elements.

xtremely high'

anan

nich runs
dine from
les River,
levels of
grene and
aboratory

, bacteria
mes high-
es in Bos-
in the re-
environ-

mental group that commissioned the tests.

"Even one drop of water as contaminated as this is dangerous to people with low immune systems, children or HIV-positive people," said Irene Gillis, chairwoman of Restore Olmsted's Waterway. Speaking at a conference on the Muddy River held at Harvard's School of Public Health yesterday, she and other activists warned residents not to swim in the water, eat fish caught there or even touch the water.

MUDDY, Page B4

lobe 11/17/96

show high pollution

■ MUDDY
Continued from Page B1

"Even if your dog runs through this water and you pet him, he can bring waterborne disease into your home," Gillis said.

Restore Olmsted's Waterway is a citizens' group dedicated to cleaning up the Muddy River, the 3½-mile waterway that snakes through the Emerald Necklace of parks and green space designed 100 years ago by Frederick Law Olmsted.

The group's decade-long fight over the Muddy took on renewed importance in the last few weeks when the reed-choked and sewage-contaminated river flooded into residential basements and subway stations. The river has flooded twice in the last two months and polluted water from the Muddy flows into the Charles River.

Former Gov. Michael S. Dukakis, in an interview at the conference, faulted his successor in the State House for not taking leadership in stopping pollution of a riverway that passes close to the homes of thousands of Boston and Brookline residents.

"This is a state responsibility, and you know who should be here? The guy in the governor's office. It's one thing to say you care about the environment, and it's another to put your money where your mouth is," Dukakis said of Gov. William F. Weld.

"If he had taken a dive in [the Muddy River] at Charlesgate, he'd never have come up," Dukakis said in a mocking reference to Weld's much-hyped splash into the Charles River after signing a rivers protection bill.

But Weld's spokesman, Bob Bliss, expressed disbelief that Dukakis would wag a finger at Weld.

"I'm surprised that Gov. Dukakis, who was a few days late and a couple of hundred million dollars short in cleaning up Boston Harbor, would be criticizing anyone on an environmental cleanup," Bliss said.

Rick Lombardi, a spokesman for the state Executive Office of Environmental Affairs, insisted that Weld "has taken the initiative" to clean up the river. "We have appointed a mediator to work with a multitude of groups, the city of Boston, Massachusetts Water Resources Authority and the Army Corps of Engineers to try to bring a plan into action," he said.

Samples taken last month from sediment at the base of the Netherlands Road bridge in Brookline, near the town's water and sewer works, found 63,000 colonies per gram of clostridium perfringens bacteria, which can cause gas gangrene and gastrointestinal disorders, according to Fred Youngs, director of the Citizens' Environmental Laboratory in Cambridge. That is 21 times higher than the levels recorded at sewage outfalls in the harbor, he said.

The clostridium signals the presence of other pathogens or disease-bearing organisms such as hepatitis A, staphylococcus and salmonella, Youngs said.

The tests also found elevated levels of the waterborne pathogen enterococcus. In one spot, the bacteria was measured at 5 ½ times the level permitted by Environmental Protection Agency guidelines.

Youngs noted that the levels of fecal coliform – which indicates the presence of raw human sewage in water – measured in the Muddy in a 1992 study by the Army Corps of Engineers was in some cases between 1,000 and 2,500 times higher than EPA guidelines, outstripping the levels in the Charles River that caused alarm a few months ago.

Documents obtained recently indicate that in 1992, when the dangerously elevated levels of fecal coliform were found in the Muddy River, federal officials rejected as too costly plans to improve flood control along the river.

But damage and cleanup costs for the MBTA from last month's flooding – which forced the closing of the Kenmore Square station for several days and disrupted service for 200,000 riders – is expected to run between $15 and $20 million, calling into question the Army Corps of Engineers' recommendation rejecting flood control four years ago.

Cathleen Douglas Stone, environmental services director for the city of Boston, said Mayor Thomas M. Menino has a commitment to preserving open space in the city, and is studying ways to limit pollution of the Muddy, from reducing or eliminating discharge into the river to keeping Boston streets cleaner so garbage won't blow into the river.

Dr. Alan Balsam, director of Brookline's Public Health Department, warned that people should be cautious about recreational activity near the Muddy.

But Balsam added that Brookline aims within the next year and a half to fix all 39 improper sewer hookups or discharges that are polluting the Muddy with sewage.

PAGE 5 OF 5

ict XC	bridge dept. no. B-16-365

MASSACHUSETTS HIGHWAY DEPARTMENT

UNDERWATER OPERATIONS TEAM

DIVERS ACTIVITY REPORT

wn ON	5-facility carried US 1 SB ON RAMP	6-features intersected BEACON ST & MUDDY RIVER	93b-date inspected 12/22/97
8-structure no. MDC 896 30D 131	foundation type	dive master R. BONICA	
on level	access to bridge EMBANKMENT	team members J. FITZGERALD, J. DONAHUE, B. SULLIVAN	
onditions ILT, GRAVEL, BOULDERS	water conditions HIGH BACTERIA POLLUTION	depth 2 m +/-	visibility 1 m +/-
current NIL			

em 60 (Underwater)

bstructure	7
Abutments	
) Wings	NA
Breastwall	NA
Pointing	NA
Footings	NA
Piles	NA
Scour	NA
Undermining	NA
Settlement	NA
	NA
	NA
iers or Bents	
Stem	7
Pointing	NA
Column	NA
Footing	7
Piles	X
Scour	6
Undermining	NO
Settlement	8
	NA
e Bents	
Concrete Piles	NA
imber Piles	NA
iagonal Bracing	NA
Horizontal Bracing	NA
asteners	NA
	NA

ndermining rated as YES or NO

4. Fender System

a.) Piles	NA
b.) Diagonal Bracing	NA
c.) Horizontal Bracing	NA
d.) Wales	NA
e.) Fasteners	NA
f.) Ladders	NA
g.)	NA
h.)	NA

Item 61 (Underwater) 7

Channel and Channel Protection

1. Debris	7
2. Aggradation	7
3. Utilities	X
4. Rip Rap	NA
5.	NA
6.	NA

Item 113 **Scour Critical Bridges**

Scour

a.) Footing Exposed	Y
b.) Undermining	N

Scour Countermeasures

a.) Sheeting	N
b.) Rip Rap	Y
c.) Other	N

Y=YES N=NO

Submitted by: R. Bonica

KNOWN NA=NOT APPLICABLE IA=INACCESSIBLE

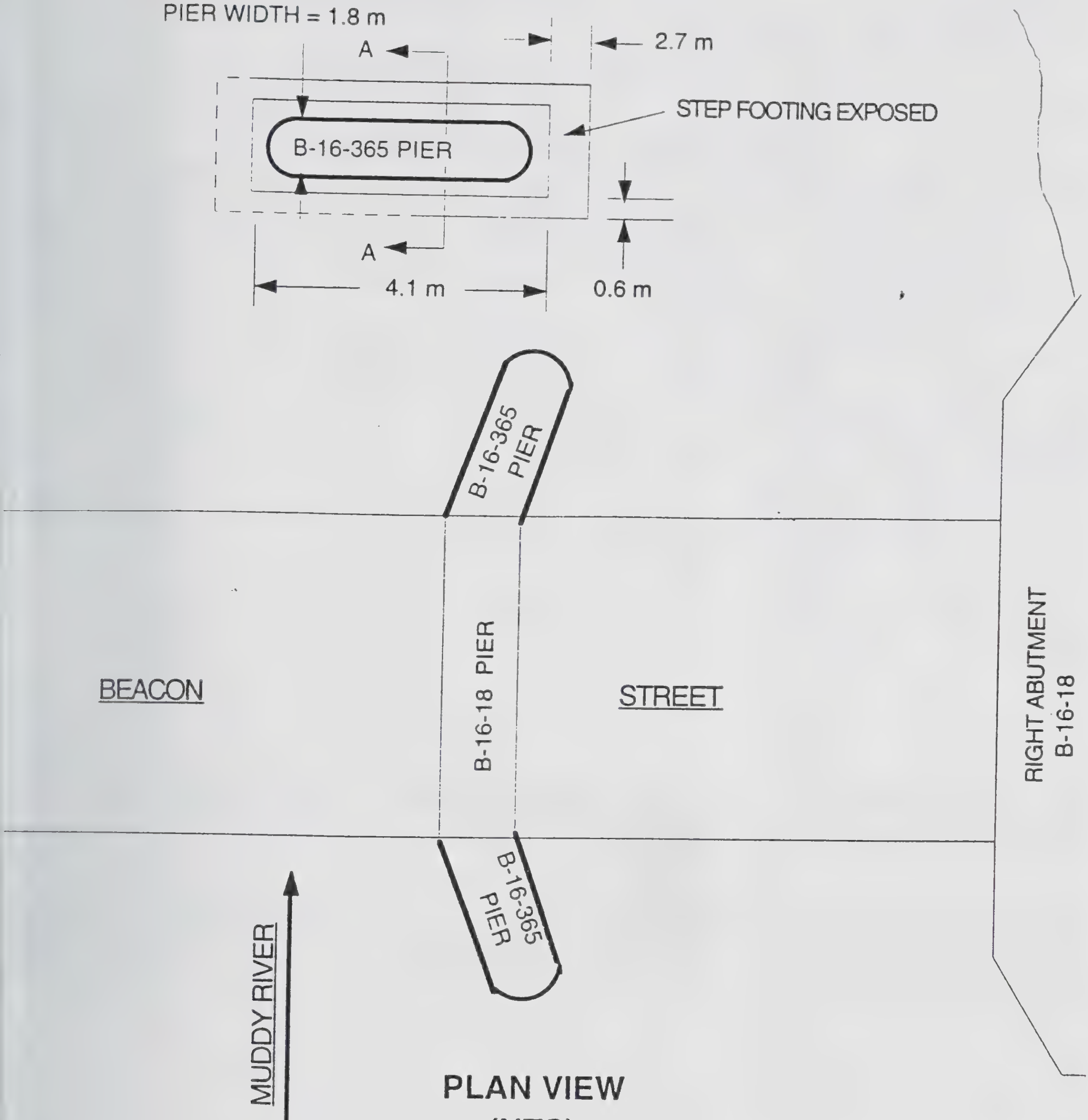
AR FILE

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECT
BOSTON	4FG	B-16-365	MDC 896 30D 131	Decer

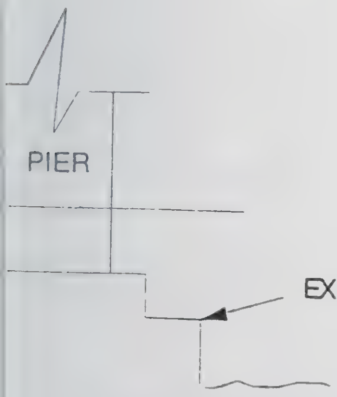
REMARKS & PHOTOS

The underwater elements of this structure consist of 3 concrete piers. Two of the piers
upstream and downstream ends of the center pier of the bridge which carries Beacon St.
River (B-16-18). The third concrete pier is located downstream of the Beacon St. Bridg
two footing steps exposed at the downstream side, right side, and half of the upstream
View)

Concrete piers have minor concrete abrasion exposing coarse aggregate, at the waterline.



PLAN VIEW
(NTS)



B-16-365(SB)
PIER SECTION 'A-A'
(NTS)

BOSTON B-16-365(SB) BIN: 4FG

SCOUR MONITORING CHART

	11/26/91	12/10/94	12/22/97
DOWNSTREAM PIER			
US LEFT CORNER	2.2 m	2.1 m	2.2 m
DS LEFT CORNER	1.7 m	1.7 m	2.2 m
US RIGHT CORNER	2.4 m	2.4 m	2.2 m
DS RIGHT CORNER			
ON FTG (2ND STEP)	- - -	- - -	2.2 m
OFF FTG	2.4 m	2.3 m	2.4 m
BEACON ST. PIER			
US EXTENSION			
US NOSE	2.4 m	2.4 m	- - -
DS EXTENSION			
DS NOSE	2.0 m	2.0 m	2.1 m
Y	0.24 m	0.27 m	0.15 m
CORRECTION FACTOR	- - -	-0.03 m	-0.09 m

NOTES:

1. *WATERLINE TO TOP STEP OF DOWNSTREAM PIER = Y = 0.24 m (11/26/91)*
2. *SOUNDINGS CORRECTED TO 11/26/91 WATERLINE*
3. *ALL MEASUREMENTS ARE IN METRIC*

MASSACHUSETTS HIGHWAY DEPARTMENT
STRUCTURES INSPECTION FIELD REPORT
ROUTINE INSPECTION

.I.N. 4FG

PAGE 1 OF 3
BR. DEPT. NO. B16365

STON
8-STRUCTURES NO. MDC89630D131
11-MILE POINT 000.010
41-STATUS P
90-ROUTINE INSP DATE 7-11-97

CARRIED L SB ON RAMP
MEMORIAL NAME/LOCAL NAME BOWKER ON BEACON ST, MUDDY RIVER
27-YR BUILT 1965
106-YR REBUILT
YR REHAB'D (NON 1 1993

S INTERSECTED ON ST. MUDDY RIVER
26-FUNCTIONAL CLASS. URBAN ART.
DIST. BRIDGE INSPECTION ENGINEER David L Lenhard
CONSULTANT'S STAMP

RE TYPE ER FLOOR BEAM
22-OWNER MDC
21-MAINTAINER MDC
TEAM LEADER R.E. Carr

PE RETE C.I.P.
WEATHER SUNNY
TEMP(f) 70's
TEMP(c)
TEAM MEMBERS J. YUAN J. DAVISON

	6	DEF
surface	6	M.P.
ndition	6	M.P
ace forms	N	1
	7	1
	N	1
	7	1
	3	S.P.
	3	S.P.
le Fence	N	1
System	5	M.P
Standards	[illegible]	[illegible]
[illegible]	N	[illegible]
ts	6	M.P
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

L N/E 7 S/W 8

S

		DEF
condition	7	1
Settlement	7	1
Settlement	H	1

GNS (Y/N) N

		DEF
kls	N	1
lts	N	1
ns	N	1

ITEM 59 7
SUPERSTRUCTURE

			DEF
1. Stringers		N	1
2. Floorbeams		6	M.P.
3. Floor System Bracing		N	1
4. Girders or Beams		6	M.P
5. Trusses - General		N	1
a. Upper Chords	N		1
b. Lower Chords	N		1
c. Web Members	N		1
d. Lateral Bracings	N		1
e. Sway Bracings	N		1
f. Portals	N		[illegible]
g. End Posts	N		[illegible]
6. Pin & Hangers		N	1
7. Conn Plt's, Gussets& Angles		[illegible]	[illegible]
8. Cover Plates		7	[illegible]
9. Bearing Devices		7	1
10. Diaphragms/Cross Frames		7	1
11. Rivets & Bolts		7	1
12. Welds		7	1
13. Member Alignment		8	1
14. Paint/Coating		6	M.P.
15.			

Year Painted: 1965

COLLISION DAMAGE: *Please explain*
None [✓] Minor ( ) Moderate ( ) Severe ( )

LOAD DEFLECTION: *Please explain*
None ( ) Minor [✓] Moderate ( ) Severe ( )

LOAD VIBRATION: *Please explain*
None ( ) Minor [✓] Moderate ( ) Severe ( )

Any Fracture Critical Member : (Y/N) N

Any Cracks : (Y/N) N

ITEM 60 7
SUBSTRUCTURE

			DEF
1. Abutments		7	[illegible]
a. Wingwalls	7		1
b. Backwalls	7		1
c. Breastwalls	7		1
d. Bridge Seats	7		1
e. Pedestals	7		1
f. Footings	H		1
g. Piles	H		1
2. Piers or Bents		7	[illegible]
a. Caps	7		1
b. Pedestals	7		1
c. Columns	N		1
d. Webs	7		1
e. Footings	H		[illegible]
f. Piles	H		[illegible]
3. Pile Bents		N	[illegible]
a. Piles	N		1
b. Diagonal Bracing	N		[illegible]
c. Horizontal Bracing	[illegible]		[illegible]
d. Fasteners	[illegible]		[illegible]
4. Settlement		8	[illegible]
5. Pointing		N	1
6. Erosion		8	1
7. Debris on Seats		6	M.P.
8. Slope Paving		N	1
9.			
10.			

COLLISION DAMAGE: *Please explain*
None [✓] Minor ( ) Moderate ( ) Severe ( )

UNDERMINING (Y/N) : If YES please explain N

SCOUR: *Please explain*
None [✓] Minor ( ) Moderate ( ) Severe ( )

ITEM 60 FROM U/W INSP. N

93b-U/W INSP DATE: ——

OWN N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

PAGE 5 OF 5

	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION DATE
N	4FG	B16365	MDC89630D131	7-11-97

REMARKS & PHOTOS:

WEARING SURFACE (BITUMINOUS) BREAKING UP AT JOINTS
MAP CRACKING (SOFFIT) IS PREVALENT THROUGH-OUT,
SPECIALLY AT JOINTS.
-11 ~ PARAPETS, RAILING AND LIGHTING INCORPORATED
PARAPET BREAKING UP AT ELECTRIC BOXES. RAILING
AND LIGHTING ARE MISSING AND BROKEN. LIGHTING
IS NOT ON.
~ DRAINS ARE CLOGGED
- CONCRETE UNDER IS HEAVILY SPALLED EXPOSED
REBAR.
FB ARE SEVERELY CORRODED WITH STRATIFIED RUST LOSS
F SECTION UP TO 20%.
ENDS OF GIRDERS (AT JOINTS) ARE SEVERELY
ORRODED
HEAVILY RUSTED
DEBRIS FROM EXPANSION JOINT.

```
: 08/12/1997                                                         BOWKER ON/BCON MUDDY

State Information ******************          ********** Classification **************** Code
 List=Y                                 (112) NBIS Bridge Length                              Y
55                                      (104) Highway System - NHS                            1
                                         (26) Functional Class - Urban Arterial              14
                         AASHTO=066.4   (100) Defense Highway                                 0
Identification *********************    (101) Parallel Structure                              L
umber                      MDC89630D131 (102) Direction of Traffic                            1
oute                          127000013 (103) Temporary Structure
ay Department District               04 (110) Designated National Network                     0
     025    (4) Place code        07000  (20) Toll                                            3
ersected   COMB  BEACON ST MUDDY RV      (21) Maintain - Other State                         21
ried       US  1 SB ON RAMP              (22) Owner - Other State                            21
           .2 MI S OF ST RTE 2A          (37) Historical Significance                         5
                               000.000        ********** Condition ******************** Code
 D 20.9    (17) Longitude 071 D 05.6     (58) Deck                                            6
e State Code                 Share   %   (59) Superstructure                                  7
e Structure No.     #                    (60) Substructure                                    7
tructure Type and Material ********      (61) Channel & Channel Protection                    8
pe Main: Steel                           (62) Culverts                                        N
irder                         Code 302        ********** Load Rating and Posting ******* Code
pe Appr: Other                           (31) Design Load - H 20                              4
                              Code 000   (64) Operating Rating - Type 3S2                   556
ans in main unit                   003   (66) Inventory Rating - Type 3S2                   536
proach spans                      0000   (70) Bridge Posting                                  5
re Type                       Code   1   (41) Structure - Posted for load                     P
ace / Protective System:                      ********** Appraisal ******************** Code
ing surface                   Code   6   (67) Structural Evaluation                           5
rane                          Code   2   (68) Deck Geometry                                   3
 protection                   Code   0   (69) Underclearances, vert. and horiz.               3
ge and Service *******************       (71) Waterway adequacy                               6
                                  1965   (72) Approach Roadway Alignment                      5
ucted                             0000   (36) Traffic Safety Features                      1000
ce: On - 2nd level                      (113) Scour Critical Bridges                          6
-WW                           Code  66        ********** Proposed Improvements *************
ructure   02   Under Structure    03     (75) Type of Work                          Code  351
 Traffic                        016495   (76) Length of Structure Improvement       000220 FT
     90 (109) Truck ADT           10 %   (94) Bridge Improvement Cost              $1,056,000
r length                         00 MI   (95) Roadway Improvement Cost               $106,000
ometric Data ********************        (96) Total Project Cost                   $1,584,000
imum span                      0070 FT   (97) Year of Improvement Cost Estimate          91
gth                          000220 FT  (114) Future ADT                                024117
alk:   Left 02.0 FT  Right 02.0 FT      (115) Year of Future ADT                         12
y Width Curb to Curb          026.0 FT        ********** Inspections *********************
t to Out                      032.0 FT   (90) Inspection Date  0797     (91) Frequency  24 MO
way Width (w/shoulders)         030 FT   (92) Critical Feature Inspection:      (93) CFI DATE
                                Code 0    (A) Fracture Critical Detail - N - 00     MO A)
DEG         (35) Structure Flared 1       (B) Underwater Inspection    - N - 00     MO B)
te MIN Vert Clear       99 FT 99 IN       (C) Other Special Inspection - N -        MO C)
te Total Horiz Clear       26.0 FT        (*) Critical Member          - N00        MO *)
r Over Bridge Rdwy      99 FT 99 IN       (*) In-depth Inspection      - A          MO *) A
rclear ref          H   00 FT 00 IN       (*) Closed Bridge            - N.         MO *)
clear RT ref        H      00.0 FT        (*) Damage Inspection        - N/A        MO *)
clear LT                   00.0 FT            ********* Loads ****************************
vigation Data ******************                      H20    Type 3    Type 3S2    Type HS
ntrol                           Code 0        Operating   135    443       556
on                              Code          Inventory   122    427       536
tical Clearance                 000 FT        ********** Posting **************************
dge Nav Min`Vert Clear              FT        Status POSTED                     Date 03/16/1989
izontal Clearance              0000 FT        2 Axle 122        3 Axle 427        5 Axle 536
```

Report date: 06/25/1997

BOWKER ON/BCON MUDDY

********** State Information *****************

FHWA Select List-Y

BDEPT#-B16365

Town-Boston

B.I.N.-4FG AASHTO-066.4

********** Identification ********************

(8)	Structure Number	MDC89630D131
(5)	Inventory Route	127000013
(2)	State Highway Department District	04
(3)	County Code 025 (4) Place code	07000
(6)	Features Intersected	COMB BEACON ST MUDDY RV
(7)	Facility Carried	US 1 SB ON RAMP
(9)	Location	.2 MI S OF ST RTE 2A
(11)	Milepoint	000.000
(16)	Latitude 42 D 20.9 (17) Longitude	071 D 05.6
(98)	Border Bridge State Code Share	%
(99)	Border Bridge Structure No.	#

********** Structure Type and Material ********

(43)	Structure Type Main: Steel Stringer/Girder	Code 302
(44)	Structure Type Appr: Other Other	Code 000
(45)	Number of spans in main unit	003
(46)	Number of approach spans	0000
(107)	Deck Structure Type	Code 1
(108)	Wearing Surface / Protective System:	
A)	Type of wearing surface	Code 6
B)	Type of membrane	Code 2
C)	Type of deck protection	Code 0

********** Age and Service *******************

(27)	Year Built	1965
(106)	Year Reconstructed	0000
(42)	Type of Service: On - 2nd level Under - HWY-WW	Code 66
(28)	Lanes: On Structure 02 Under Structure	03
(29)	Average Daily Traffic	016495
(30)	Year of ADT 90 (109) Truck ADT	10 %
(19)	Bypass, detour length	00 MI

********** Geometric Data ********************

(48)	Length of maximum span	0070 FT
(49)	Structure Length	000220 FT
(50)	Curb or sidewalk: Left 02.0 FT Right	02.0 FT
(51)	Bridge Roadway Width Curb to Curb	026.0 FT
(52)	Deck Width Out to Out	032.0 FT
(32)	Approach Roadway Width (w/shoulders)	030 FT
(33)	Bridge Median -	Code 0
(34)	Skew 05 DEG (35) Structure Flared	1
(10)	Inventory Route MIN Vert Clear	99 FT 99 IN
(47)	Inventory Route Total Horiz Clear	26.0 FT
(53)	Min Vert Clear Over Bridge Rdwy	99 FT 99 IN
(54)	Min Vert Underclear ref H	00 FT 00 IN
(55)	Min Lat Underclear RT ref H	00.0 FT
(56)	Min Lat Underclear LT	00.0 FT

********** Navigation Data *******************

(38)	Navigation Control	Code 0
(111)	Pier Protection	Code
(39)	Navigation Vertical Clearance	000 FT
(116)	Vert-lift Bridge Nav Min Vert Clear	FT
(40)	Navigation Horizontal Clearance	0000 FT

********** Classification ***************

(112)	NBIS Bridge Length	
(104)	Highway System - NHS	
(26)	Functional Class - Urban Arterial	
(100)	Defense Highway	
(101)	Parallel Structure	
(102)	Direction of Traffic	
(103)	Temporary Structure	
(110)	Designated National Network	
(20)	Toll	
(21)	Maintain - Other State	
(22)	Owner - Other State	
(37)	Historical Significance	

********** Condition ********************

(58)	Deck	
(59)	Superstructure	
(60)	Substructure	
(61)	Channel & Channel Protection	
(62)	Culverts	

********** Load Rating and Posting *******

(31)	Design Load - H 20	
(64)	Operating Rating - Type 3S2	
(66)	Inventory Rating - Type 3S2	
(70)	Bridge Posting	
(41)	Structure - Posted for load	

********** Appraisal ********************

(67)	Structural Evaluation	
(68)	Deck Geometry	
(69)	Underclearances, vert. and horiz.	
(71)	Waterway adequacy	
(72)	Approach Roadway Alignment	
(36)	Traffic Safety Features	1
(113)	Scour Critical Bridges	

********** Proposed Improvements **********

(75)	Type of Work	Code
(76)	Length of Structure Improvement	000220
(94)	Bridge Improvement Cost	$1,056,
(95)	Roadway Improvement Cost	$106,
(96)	Total Project Cost	$1,584,
(97)	Year of Improvement Cost Estimate	
(114)	Future ADT	024
(115)	Year of Future ADT	

********** Inspections **********************

(90) Inspection Date ~~0995~~ 0797 (91) Frequency 24

(92) Critical Feature Inspection: (93) CFI D

(A)	Fracture Critical Detail	- N - 00	MO A)
(B)	Underwater Inspection	- N - 00	MO B)
(C)	Other Special Inspection	- N -	MO C)
(*)	Critical Member	- N00	MO *)
(*)	In-depth Inspection	- A	MO *) A
(*)	Closed Bridge	- N	MO *)
(*)	Damage Inspection	- N/A	MO *)

********** Loads *************************

	H20	Type 3	Type 3S2	Type
Operating	135	443	556	
Inventory	122	427	536	

********** Posting ***********************

Status POSTED Date 03/16/

2 Axle 122 3 Axle 427 5 Axle

State Information

FHWA Select List= Y

AASHTO= 067.5

Identification

MDC89630D131

127000013

partment District 04

025 (4) Place code 07000

ed COMB BEACON ST MUDDY RV

US 1 SB ON RAMP

.2 MI S OF ST RTE 2A

0000.016

twork Y

ıte & Subroute

42 DEG 21 MIN 00.04 SEC

71 DEG 05 MIN 33.98 SEC

te Code Share %

ıcture No. #

Structure Type and Material

ain: Steel Code 302

Jointless bridge type: Not applicable

ppr:

Code 000

n main unit 003

ch spans 0000

ype - Concrete Cast-in-Place Code 1

/ Protective System:

surface - Bituminous Code 6

e - Preformed Fabric Code 2

tection - None Code 0

Age and Service

1965

ted 0000

n - Overpass at Interchange

aterway Code 66

e 02 Under structure 03

ffic 027000

1997 (109) Truck ADT 10 %

gth 000 KM

Geometric Data

ı span 0021.3 M

00067.1 M

Left 00.6 M Right 00.6 M

dth Curb to Curb 007.9 M

Out 009.8 M

Width (w/shoulders) 009.1 M

lo median Code 0

DEG (35) Structure Flared Y

N Vert Clear 99.99 M

tal Horiz Clear 07.9 M

Bridge Rdwy 99.99 M

r ref H 00.00 M

RT ref H 00.0 M

LT 00.0 M

Navigation Data

No navigation control on waterway Code 0

Code

Clearance 000.0 M

Min Vert Clear M

al Clearance 0000.0 M

Classification

		Code
(112) NBIS Bridge Length		Y
(104) Highway System		Y
(26) Functional Class -	Urban Arterial	14
(100) Defense Highway		0
(101) Parallel Structure		L
(102) Direction of Traffic -	1-way traffic	1
(103) Temporary Structure		N
(105) Federal Lands Highways		0
(110) Designated National Network		N
(20) Toll -	On free road	3
(21) Maintain -	Other State Agencies	21
(22) Owner -	Other State Agencies	21
(37) Historical Significance	built after 1949 presumed to be not	Z

Condition

	Code
(58) Deck	6
(59) Superstructure	7
(60) Substructure	7
(61) Channel & Channel Protection	8
(62) Culverts	N

Load Rating and Posting

		Code
(31) Design Load -	H 20	4
(63) Operating Rating Method	Allowable Stress (AS)	2
(64) Operating Rating		35.6
(65) Inventory Rating Method -	Allowable Stress (AS)	2
(66) Inventory Rating		22.9
(70) Bridge Posting		5
(41) Structure -	Posted for load	P

Appraisal

	Code
(67) Structural Evaluation	5
(68) Deck Geometry	2
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	6
(72) Approach Roadway Alignment	5
(36) Traffic Safety Features	1 0 0 0
(113) Scour Critical Bridges	6

Inspections

(90) Inspection Date 07/21/99 (91) Frequency 24 MO

(92) Critical Feature Inspection:				(93) CFI DATE
(A) Fracture Critical Detail	N	00	MO A)	00/00/00
(B) Underwater Inspection	Y	36	MO B)	12/22/97
(C) Other Special Inspection	N	00	MO C)	00/00/00
(*) Other Inspection	N	00	MO *)	00/00/00
(*) Closed Bridge	N	00	MO *)	00/00/00
(*) Damage Inspection			MO *)	00/00/00

Loads

Date 00/00/00	H20	Type 3	Type 3S2	Type HS
Operating	35	43	56	00
Inventory	22	27	36	00

Posting

Status POSTED Date 03/16/89

2 Axle 22 3 Axle 27 5 Axle 36

Misc.

Bridge Name BOWKER ON/BCON MUDDY

N Anti-missile fence N Acrow Panel N Jointless Bridge

Accessibility

N	Liftbucket	N	Rigging	Inspection
N	Ladder	N	Staging	Hours: 06
N	Boat	N	Traffic Control	
N	Wader	N	RR Flagperson	
N	Inspector 50	N	Police	

ct

MASSACHUSETTS HIGHWAY DEPARTMENT

UNDERWATER OPERATIONS TEAM

DIVERS ACTIVITY REPORT

bridge dept. no. B-16-365

vn ON	5-facility carried US 1 NB OFF RAMP	6-features intersected MUDDY RIVER, MBTA SUB	93b-date inspected 12/22/97
8-structure no. MDC 896 30A 111	foundation type		dive master R. BONICA
n level	access to bridge EMBANKMENT	team members J. FITZGERALD, J. DONAHUE, B. SULLIVAN	
onditions RAVEL, BOULDERS, MUD	water conditions HIGH BACTERIA POLLUTION	depth 2.5 m +/- visibility 1 m +/-	current NIL

m 60 (Underwater) **7**

structure

butments

Wings	NA
Breastwall	NA
Pointing	NA
Footings	NA
Piles	NA
Scour	NA
Undermining	NA
Settlement	NA
	NA
	NA

iers or Bents

tem	7
Pointing	NA
olumn	NA
ooting	NA
iles	NA
cour	NA
ndermining	NO
ettlement	8
	NA

Bents

oncrete Piles	NA
mber Piles	NA
agonal Bracing	NA
orizontal Bracing	NA
asteners	NA
	NA

ndermining rated as YES or NO

4. Fender System

a.) Piles	NA
b.) Diagonal Bracing	NA
c.) Horizontal Bracing	NA
d.) Wales	NA
e.) Fasteners	NA
f.) Ladders	NA
g.)	NA
h.)	NA

Item 61 (Underwater) **7**

Channel and Channel Protection

1. Debris	7
2. Aggradation	7
3. Utilities	X
4. Rip Rap	NA
5.	NA
6.	NA

Item 113 **Scour Critical Bridges**

Scour

a.) Footing Exposed	Y
b.) Undermining	N

Scour Countermeasures

a.) Sheeting	N
b.) Rip Rap	N
c.) Other	N

Y=YES N=NO

Submitted by: R. B

KNOWN NA=NOT APPLICABLE IA=INACCESSIBLE

FILE

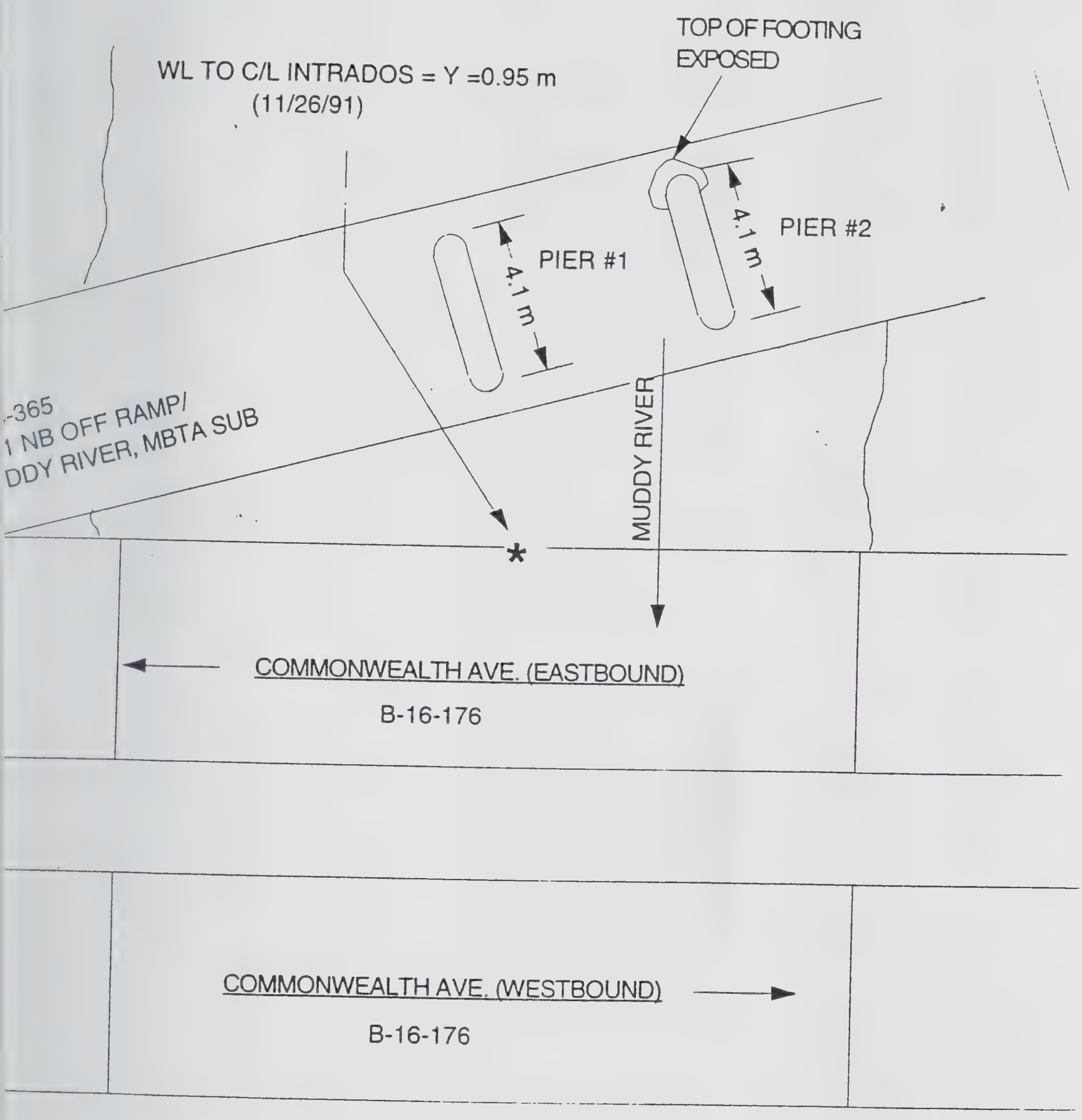
CITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTI
BOSTON	4FD	B-16-365	MDC 896 30A 111	Decem

REMARKS & PHOTOS

This structure carries US 1 NB Off Ramp over the Muddy River and the MBTA subway.
elements consist of two piers located upstream of Commonwealth Ave. (See Plan View)
Concrete pier stems have minor abrasion with coarse aggregate exposed at the waterline, 0.5

Pier No. 1:
Footing is covered, no undermining.

Pier No. 2:
Top of footing is exposed at upstream end, no undermining. See Sketch



PLAN VIEW
(NTS)

B

SCOUR MONITORING CHART

	11/26/91	12/10/94	12/22/97
PIER #1			
UPSTREAM END	0.6 m	0.4 m	0.5 m
LEFT SIDE	1.9 m	1.9 m	2.1 m
DOWNSTREAM END	2.3 m	2.2 m	2.3 m
RIGHT SIDE	0.9 m	1.1 m	1.1 m
PIER #2			
UPSTREAM END (ON FTG.)	2.5 m	2.5 m	2.5 m
LEFT SIDE	2.0 m	1.9 m	2.0 m
DOWNSTREAM END	1.3 m	1.3 m	1.4 m
RIGHT SIDE	1.9 m	1.8 m	2.0 m
Y	0.95 m	1.01 m	1.1 m
CORRECTION FACTOR	- - -	+0.06 m	+0.15 m

NOTES:

1. ALL MEASUREMENTS ARE IN METRIC.

2. WATERLINE TO C/L INTRADOS, UPSTREAM END, COMMONWEALTH AVE. EA BRIDGE = Y = 0.95 m (11/26/91)

xtremely high'

ıman

ich runs
line from
es River,
levels of
rene and
boratory

. bacteria
nes high-
s in Bos-
in the re-
environ-

mental group that commissioned the tests.

"Even one drop of water as contaminated as this is dangerous to people with low immune systems, children or HIV-positive people," said Irene Gillis, chairwoman of Restore Olmsted's Waterway. Speaking at a conference on the Muddy River held at Harvard's School of Public Health yesterday, she and other activists warned residents not to swim in the water, eat fish caught there or even touch the water.

MUDDY, Page B4

cbe 11/17/96

show high pollution

■ MUDDY

Continued from Page B1

"Even if your dog runs through this water and you pet him, he can bring waterborne disease into your home," Gillis said.

Restore Olmsted's Waterway is a citizens' group dedicated to cleaning up the Muddy River, the 3½-mile waterway that snakes through the Emerald Necklace of parks and green space designed 100 years ago by Frederick Law Olmsted.

The group's decade-long fight over the Muddy took on renewed importance in the last few weeks when the reed-choked and sewage-contaminated river flooded into residential basements and subway stations. The river has flooded twice in the last two months and polluted water from the Muddy flows into the Charles River.

Former Gov. Michael S. Dukakis, in an interview at the conference, faulted his successor in the State House for not taking leadership in stopping pollution of a riverway that passes close to the homes of thousands of Boston and Brookline residents.

"This is a state responsibility, and you know who should be here? The guy in the governor's office. It's one thing to say you care about the environment, and it's another to put your money where your mouth is," Dukakis said of Gov. William F. Weld.

"If he had taken a dive in [the Muddy River] at Charlesgate, he'd never have come up," Dukakis said in a mocking reference to Weld's much-hyped splash into the Charles River after signing a rivers protection bill.

But Weld's spokesman, Bob Bliss, expressed disbelief that Dukakis would wag a finger at Weld.

"I'm surprised that Gov. Dukakis, who was a few days late and a couple of hundred million dollars short in cleaning up Boston Harbor, would be criticizing anyone on an environmental cleanup," Bliss said.

Rick Lombardi, a spokesman for the state Executive Office of Environmental Affairs, insisted that Weld "has taken the initiative" to clean up the river. "We have appointed a mediator to work with a multitude of groups, the city of Boston, Massachusetts Water Resources Authority and the Army Corps of Engineers to try to bring a plan into action," he said.

Samples taken last month from sediment at the base of the Netherlands Road bridge in Brookline, near the town's water and sewer works, found 63,000 colonies per gram of clostridium perfringens bacteria, which can cause gas gangrene and gastrointestinal disorders, according to Fred Youngs, director of the Citizens' Environmental Laboratory in Cambridge. That is 21 times higher than the levels recorded at sewage outfalls in the harbor, he said.

The clostridium signals the presence of other pathogens or disease-bearing organisms such as hepatitis A, staphylococcus and salmonella, Youngs said.

The tests also found elevated levels of the waterborne pathogen enterococcus. In one spot, the bacteria was measured at 5 ½ times the level permitted by Environmental Protection Agency guidelines.

Youngs noted that the levels of fecal coliform – which indicates the presence of raw human sewage in water – measured in the Muddy in a 1992 study by the Army Corps of Engineers was in some cases between 1,000 and 2,500 times higher than EPA guidelines, outstripping the levels in the Charles River that caused alarm a few months ago.

Documents obtained recently indicate that in 1992, when the dangerously elevated levels of fecal coliform were found in the Muddy River, federal officials rejected as too costly plans to improve flood control along the river.

But damage and cleanup costs for the MBTA from last month's flooding – which forced the closing of the Kenmore Square station for several days and disrupted service for 200,000 riders – is expected to run between $15 and $20 million, calling into question the Army Corps of Engineers' recommendation rejecting flood control four years ago.

Cathleen Douglas Stone, environmental services director for the city of Boston, said Mayor Thomas M. Menino has a commitment to preserving open space in the city, and is studying ways to limit pollution of the Muddy, from reducing or eliminating discharge into the river to keeping Boston streets cleaner so garbage won't blow into the river.

Dr. Alan Balsam, director of Brookline's Public Health Department, warned that people should be cautious about recreational activity near the Muddy.

But Balsam added that Brookline aims within the next year and a half to fix all 39 improper sewer hookups or discharges that are polluting the Muddy with sewage.

PAGE 5 OF 5

Element Data Collection Form

Month	Day	Year
12	22	97

Bridge Number B-16-365

BIN 4FD

Bridge Key Number MDC 896 30A 111

Town BOSTON

District 4

Inspectors			
BONICA	FITZGERALD, DONAHUE, SULLIVAN	U/W OPNS	
Leader	*Member*	*Agency/Consultant/Dept.*	*Name*

ent	Units	Env-iron.	Total Quantity	Condition States (Quantity or Percent) * 1	2	3	4	5	Q or P *
VALL	M	2	8.2	8.2					Q
MERGED FOOTING	EA	2	2	1 *					Q
LY TOP OF FOOTING VISIBLE, PIER #2, UPSTREAM END									

ch between Quantity and Percent for different Elements.

MASSACHUSETTS HIGHWAY DEPARTMENT

STRUCTURES INSPECTION FIELD REPORT
ROUTINE INSPECTION

B-16-365

PAGE 1 OF 3

BR. DEPT. NO. ~~6-2097~~

TON	8-STRUCTURES NO. MDC 89630A111	11-MILE POINT 000.010	41-STATUS A	90-ROUTINE INSP DATE 6-19-97

ED B. OFF RAMP	MEMORIAL NAME/LOCAL NAME BOWKER	27-YR BUILT 1965	106-YR REBUILT —	YR REHAB'D (NON 106) —

RSECTED RIVER MBTA SUB.	26-FUNCTIONAL CLASS. URBAN ART.		DIST. BRIDGE INSPECTION ENGINEER David L Lenhardt	CONSULTANT'S STAMP:
PE L GIRDER	22-OWNER MDC	21-MAINTAINER MDC	TEAM LEADER R.E. Carr CARR	
Concrete	WEATHER Sunny	TEMP(a) 80s / TEMP(c) –	TEAM MEMBERS J. DAVISON	

	6	DEF
ace	6	
on	6	
forms	N	
	7	
	N	
	7	
	5	
	5	
ence	8	
tem	5	
dards	2	
	7	
	5	

/E	~~S/W~~
8	—

		DEF
ndition	7	|
ttlement	8	|
tlement	7	|

NS (Y/N) Y

		DEF
	N	|
	7	|
	7	|

ITEM 59 SUPERSTRUCTURE 6

		DEF
1. Stringers	N	.
2. Floorbeams	6	
3. Floor System Bracing	N	
4. Girders or Beams	7	
5. Trusses - General	N	
a. Upper Chords	N	
b. Lower Chords	N	
c. Web Members	N	
d. Lateral Bracings	N	
e. Sway Bracings	N	
f. Portals	N	
g. End Posts	N	
6. Pin & Hangers	N	
7. Conn Plt's, Gussets & Angles	N	
8. Cover Plates	7	
9. Bearing Devices	5	
10. Diaphragms/Cross Frames	7	
11. Rivets & Bolts	5	
12. Welds	7	
13. Member Alignment	7	
14. Paint/Coating	5	
15.		
Year Painted:		

COLLISION DAMAGE: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

LOAD DEFLECTION: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

LOAD VIBRATION: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

Any Fracture Critical Member : (Y/N) Y

Any Cracks : (Y/N) N

ITEM 60 SUBSTRUCTURE 7

		DEF
1. Abutments	7	▨
a. Wingwalls	7	|
b. Backwalls	7	|
c. Breastwalls	7	|
d. Bridge Seats +	7	|
e. Pedestals	7	|
f. Footings	H	|
g. Piles	H	|
2. Piers or ~~Bents~~	7	▨
a. Caps	6	|
b. Pedestals	7	|
c. Columns	N	|
d. Webs	7	|
e. Footings	H	|
f. Piles	H	|
3. Pile Bents	N	▨
a. Piles	N	|
b. Diagonal Bracing	N	|
c. Horizontal Bracing	N	|
d. Fasteners	N	|
4. Settlement	8	|
5. Pointing	N	|
6. Erosion	7	|
7. Debris on Seats +	6	|
8. Slope Paving	7	|
9.		
10.		

COLLISION DAMAGE: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

UNDERMINING (Y/N): If YES please explain N

SCOUR: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

ITEM 60 FROM U/W INSP. 7

93b-U/W INSP DATE: 12 94

WN N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

PAGE 5 OF 5

	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION DATE
N	4FD	B16-365	MDC P96 30A 111	6-20-97

REMARKS & PHOTOS:

it Conc. SURFACE BREAKUP AROUND Sealed JOINTS.
Conc. @ JOINTS under BREAKING UP. Spalled
on Piers
Slight Collision Damage To: CURB (FLOW) EAST ONLY.
Concrete PARAPET BREAK up at Electric HAND Holes.
ts.)
Rail - LIGHTING - inCORParaTED. many SECTIONS.
NG.
- DRAINS are FULL OF Debris. NOT FUncTioning
None FUNCTIONAL.-
Joints Paved over - BREAKing up at SURFACE
g ON F.B. and GIRDER BEAMS.
Severe RUST SLIGHT LOSS OF SECTION, @ Pier #4
Severe RUST BEARING are FROZEN @ all Piers.
Two VERTICAL CRACKS NORTH WALL SLIGHT Exudation.
Pier #1 HEAVY Spalling under Cap EAST Side
tal CRACK along Top SAME. Exposed Rebar
area.
lled Conc. on Piers HEAVY.

BOWKER NB OFF RAMP

```
tate Information *****************
List=Y
5

                      AASHTO=071.4
dentification *******************
mber                  MDC89630A111
ute                      127000001
y Department District           04
   025    (4) Place code     07000
ersected  WATER MUDDY RIV MBTA SUB
ried      US  1 NB OFF RAMP
          .2 MI S OF ST RTE 2A
                           000.000
D 20.9    (17) Longitude 071 D 05.6
e State Code          Share     %
e Structure No.    #
tructure Type and Material *******
pe Main: Steel
loorbeam                  Code 303
pe Appr: Other
                          Code 000
ans in main unit               004
proach spans                  0000
re Type                   Code   1
ce / Protective System:
ng surface                Code   6
rane                      Code   2
 protection               Code   0
e and Service ******************
                              1965
ucted                         0000
ce: On - 2nd level
erway                     Code  65
ructure   02  Under Structure   00
 Traffic                    006578
     93 (109) Truck ADT          %
r length                     00 MI
ometric Data ********************
imum span                  0070 FT
gth                      000286 FT
alk:  Left 00.5 FT  Right 02.0 FT
y Width Curb to Curb      024.0 FT
t to Out                  035.0 FT
way Width (w/shoulders)     036 FT
                            Code 0
DEG       (35) Structure Flared 0
te MIN Vert Clear     99 FT 99 IN
te Total Horiz Clear       24.0 FT
r Over Bridge Rdwy    99 FT 99 IN
rclear ref          N 00 FT 00 IN
lear RT ref         N      99.9 FT
lear LT                    00.0 FT
igation Data ******************
trol                        Code 0
n                           Code
tical Clearance             000 FT
ge Nav Min Vert Clear           FT
izontal Clearance          0000 FT
```

```
      ********** Classification *************** Code
(112) NBIS Bridge Length                            Y
(104) Highway System - NHS                          1
 (26) Functional Class - Urban Arterial            14
(100) Defense Highway                               0
(101) Parallel Structure                            R
(102) Direction of Traffic                          1
(103) Temporary Structure
(110) Designated National Network                   0
 (20) Toll                                          3
 (21) Maintain - Other State                       21
 (22) Owner - Other State                          21
 (37) Historical Significance                       Z
      ********** Condition ******************** Code
 (58) Deck                                          6
 (59) Superstructure                                6
 (60) Substructure                                  7
 (61) Channel & Channel Protection                  7
 (62) Culverts                                      N
      ********** Load Rating and Posting ******* Code
 (31) Design Load - H 20                            4
 (64) Operating Rating - Type 3S2                 556
 (66) Inventory Rating - Type 3S2                 536
 (70) Bridge Posting                                5
 (41) Structure - Open                              A
      ********** Appraisal ********************* Code
 (67) Structural Evaluation                         5
 (68) Deck Geometry                                 2
 (69) Underclearances, vert. and horiz.             N
 (71) Waterway adequacy                             7
 (72) Approach Roadway Alignment                    5
 (36) Traffic Safety Features                    1010
(113) Scour Critical Bridges                        6
      ********** Proposed Improvements *************
 (75) Type of Work                          Code  351
 (76) Length of Structure Improvement     000286 FT
 (94) Bridge Improvement Cost            $1,501,000
 (95) Roadway Improvement Cost             $150,000
 (96) Total Project Cost                 $2,252,000
 (97) Year of Improvement Cost Estimate          91
(114) Future ADT                             009472
(115) Year of Future ADT                         12
      ********** Inspections ***********************
 (90) Inspection Date  0697     (91) Frequency  24 MO
 (92) Critical Feature Inspection:      (93) CFI DATE
  (A) Fracture Critical Detail - N - 00    MO A)
  (B) Underwater Inspection    - Y - 36    MO B) 1294
  (C) Other Special Inspection - N -       MO C)
  (*) Critical Member          - N00       MO *)
  (*) In-depth Inspection      - A         MO *) A
  (*) Closed Bridge            - N         MO *)
  (*) Damage Inspection        - N/A       MO *)
      ********** Loads ****************************
                  H20    Type 3    Type 3S2   Type HS
      Operating   135    443       556
      Inventory   122    427       536
      ********** Posting **************************
      Status LEGAL                     Date 00/00/0000
      2 Axle            3 Axle             5 Axle
```

Report date: 05/30/1997

BOWKER NB OFF RAMP

P)

********** State Information ******************
FHWA Select List=Y
BDEPT#=B16365
Town=Boston
B.I.N.=4FD AASHTO=071.4

********** Identification **********************
(8) Structure Number MDC89630A111
(5) Inventory Route 127000001
(2) State Highway Department District 04
(3) County Code 025 (4) Place code 07000
(6) Features Intersected WATER MUDDY RIV MBTA SUB
(7) Facility Carried US 1 NB OFF RAMP
(9) Location .2 MI S OF ST RTE 2A
(11) Milepoint 000.000
(16) Latitude 42 D 20.9 (17) Longitude 071 D 05.6
(98) Border Bridge State Code Share %
(99) Border Bridge Structure No. #

********** Structure Type and Material ********
(43) Structure Type Main: Steel
Girder & Floorbeam Code 303
(44) Structure Type Appr: Other
Other Code 000
(45) Number of spans in main unit 004
(46) Number of approach spans 0000
(107) Deck Structure Type Code 1
(108) Wearing Surface / Protective System:
A) Type of wearing surface Code 6
B) Type of membrane Code 2
C) Type of deck protection Code 0

********** Age and Service ********************
(27) Year Built 1965
(106) Year Reconstructed 0000
(42) Type of Service: On - 2nd level
Under - Waterway Code 65
(28) Lanes: On Structure 02 Under Structure 00
(29) Average Daily Traffic 006578
(30) Year of ADT 93 (109) Truck ADT %
(19) Bypass, detour length 00 MI

********** Geometric Data *********************
(48) Length of maximum span 0070 FT
(49) Structure Length 000286 FT
(50) Curb or sidewalk: Left 00.5 FT Right 02.0 FT
(51) Bridge Roadway Width Curb to Curb 024.0 FT
(52) Deck Width Out to Out 035.0 FT
(32) Approach Roadway Width (w/shoulders) 036 FT
(33) Bridge Median Code 0
(34) Skew 00 DEG (35) Structure Flared 0
(10) Inventory Route MIN Vert Clear 99 FT 99 IN
(47) Inventory Route Total Horiz Clear 24.0 FT
(53) Min Vert Clear Over Bridge Rdwy 99 FT 99 IN
(54) Min Vert Underclear ref N 00 FT 00 IN
(55) Min Lat Underclear RT ref N 99.9 FT
(56) Min Lat Underclear LT 00.0 FT

********** Navigation Data ********************
(38) Navigation Control Code 0
(111) Pier Protection Code
(39) Navigation Vertical Clearance 000 FT
(116) Vert-lift Bridge Nav Min Vert Clear FT
(40) Navigation Horizontal Clearance 0000 FT

********** Classification ****************
(112) NBIS Bridge Length
(104) Highway System - NHS
(26) Functional Class - Urban Arterial
(100) Defense Highway
(101) Parallel Structure
(102) Direction of Traffic
(103) Temporary Structure
(110) Designated National Network
(20) Toll
(21) Maintain - Other State
(22) Owner - Other State
(37) Historical Significance

********** Condition ********************** C
(58) Deck
(59) Superstructure
(60) Substructure
(61) Channel & Channel Protection
(62) Culverts

********** Load Rating and Posting ******* C
(31) Design Load - H 20
(64) Operating Rating - Type 3S2
(66) Inventory Rating - Type 3S2
(70) Bridge Posting
(41) Structure - Open

********** Appraisal ********************* C
(67) Structural Evaluation
(68) Deck Geometry
(69) Underclearances, vert. and horiz.
(71) Waterway adequacy
(72) Approach Roadway Alignment
(36) Traffic Safety Features 10
(113) Scour Critical Bridges

********** Proposed Improvements ***********
(75) Type of Work Code 3
(76) Length of Structure Improvement 000286
(94) Bridge Improvement Cost $1,501,0
(95) Roadway Improvement Cost $150,0
(96) Total Project Cost $2,252,0
(97) Year of Improvement Cost Estimate
(114) Future ADT 0094
(115) Year of Future ADT

6/97

********** Inspection ************************
(90) Inspection Date 0[illegible] (91) Frequency 24
(92) Critical Feature Inspection: (93) CFI DA
(A) Fracture Critical Detail - N - 00 MO A)
(B) Underwater Inspection - Y - 36 MO B) 12
(C) Other Special Inspection - N - MO C)
(*) Critical Member - N00 MO *)
(*) In-depth Inspection - A MO *) A
(*) Closed Bridge - N MO *)
(*) Damage Inspection - N/A MO *)

********** Loads ***************************

	H20	Type 3	Type 3S2	Type
Operating	135	443	556	
Inventory	122	427	536	

********** Posting *************************
Status LEGAL Date 00/00/0
2 Axle 3 Axle 5 Axle

June 6, 2000 BOWKER NB OFF RAMP

State Information

365 FHWA Select List= Y

AASHTO= 066.5

Identification

ber MDC89630A111

e 127000001

Department District 04

025 (4) Place code 07000

sected WATER MUDDY RIV MBTA SUB

d US 1 NB OFF RAMP

.2 MI S OF ST RTE 2A

nt 0000.016

y Network Y

Route & Subroute

42 DEG 20 MIN 49.20 SEC

71 DEG 05 MIN 35.68 SEC

State Code Share %

Structure No. #

Structure Type and Material

e Main: Steel Code 303

n Jointless bridge type: Not applicable

e Appr:

Code 000

ans in main unit 004

proach spans 0000

ure Type - Concrete Cast-in-Place Code 1

face / Protective System:

ring surface - Bituminous Code 6

brane - Preformed Fabric Code 2

k protection - None Code 0

Age and Service

1965

structed 0000

e: On - Overpass at Interchange

aterway Code 65

ucture 02 Under structure 00

Traffic 027000

1997 (109) Truck ADT 00 %

r length 000 KM

Geometric Data

imum span 0021.3 M

gth 00087.2 M

alk: Left 00.2 M Right 00.6 M

ay Width Curb to Curb 007.3 M

ut to Out 010.7 M

dway Width (w/shoulders) 011.0 M

- No median Code 0

0 DEG (35) Structure Flared N

e MIN Vert Clear 99.99 M

e Total Horiz Clear 07.3 M

Over Bridge Rdwy 99.99 M

rclear ref N 00.00 M

clear RT ref N 00.0 M

clear LT 00.0 M

Navigation Data

ntrol - No navigation control on waterway Code 0

on Code

tical Clearance 000.0 M

e Nav Min Vert Clear M

izontal Clearance 0000.0 M

Classification		Code
(112) NBIS Bridge Length		Y
(104) Highway System		Y
(26) Functional Class -	Urban Arterial	14
(100) Defense Highway		0
(101) Parallel Structure		R
(102) Direction of Traffic -	1-way traffic	1
(103) Temporary Structure		N
(105) Federal Lands Highways		0
(110) Designated National Network		N
(20) Toll -	On free road	3
(21) Maintain -	Other State Agencies	21
(22) Owner -	Other State Agencies	21
(37) Historical Significance	built after 1949 presumed to be not	Z

Condition	Code
(58) Deck	5
(59) Superstructure	6
(60) Substructure	7
(61) Channel & Channel Protection	7
(62) Culverts	N

Load Rating and Posting		Code
(31) Design Load -	H 20	4
(63) Operating Rating Method	Allowable Stress (AS)	2
(64) Operating Rating		35.6
(65) Inventory Rating Method -	Allowable Stress (AS)	2
(66) Inventory Rating		22.9
(70) Bridge Posting		5
(41) Structure -	Open	A

Appraisal	Code
(67) Structural Evaluation	5
(68) Deck Geometry	2
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	7
(72) Approach Roadway Alignment	5
(36) Traffic Safety Features	1 0 0 0
(113) Scour Critical Bridges	6

Inspections

(90) Inspection Date 06/04/99 (91) Frequency 24 MO

(92) Critical Feature Inspection:				(93) CFI DATE
(A) Fracture Critical Detail	N	00	MO A)	00/00/00
(B) Underwater Inspection	Y	36	MO B)	12/01/97
(C) Other Special Inspection	N	00	MO C)	00/00/00
(*) Other Inspection	N	00	MO *)	00/00/00
(*) Closed Bridge	N	00	MO *)	00/00/00
(*) Damage Inspection			MO *)	00/00/00

Loads

Date 00/00/00	H20	Type 3	Type 3S2	Type HS
Operating	35	43	56	00
Inventory	22	27	36	00

Posting

Status LEGAL Date 00/00/00

2 Axle 3 Axle 5 Axle

Misc.

Bridge Name BOWKER NB OFF RAMP

N Anti-missile fence N Acrow Panel N Jointless Bridge

Accessibility

N	Liftbucket	N	Rigging	Inspection	
N	Ladder	N	Staging	Hours:	06
N	Boat	N	Traffic Control		
N	Wader	N	RR Flagperson		
N	Inspector 50	N	Police		

MASSACHUSETTS HIGHWAY DEPARTMENT

UNDERWATER OPERATIONS TEAM

DIVERS ACTIVITY REPORT

PAGE 1 OF 2

BR. DEPT. NO.
B-16-360 (S-9)

I.	4

	8-STRUCTURE NO. MTA 896 264 101	LEVEL OF INSP. I		93b- INSPECTION DATE 8/27/99
D	ACCESS TO BRIDGE Embankment	UNDERWATER OPERATIONS ENGINEER Joseph Donahue		
ECTED	DEPTH 6'	VISIBILITY 2'	TEAM LEADER (DIVE MASTER) J. Donahue	Report submitted by:
N lt	CURRENT Nil	TEAM MEMBERS J. Fitzgerald		

derwater)
RE
7

		DEF
s	7	
	N	
s	N	
	N	
	7	
	7	
/Rip-Rap	7	
	7	
	H	
	H	
	8	
	8	
nts	N	
	N	
	N	
	N	
Pierwalls	N	
	N	
	N	
	N	
	N	
	N	
	N	
	N	
	N	
	N	
ng	N	
cing	N	
	N	

(Y=Yes / N=No) N

ITEM 61 7
CHANNEL & CHANNEL PROTECTION

			DEF
1. Channel Scour		8	
2. Embankment Erosion		8	
3. Debris		7	
4. Vegetation		N	
5. Utilities		X	
6. Rip-Rap/Slope Protection		8	
7. Aggradation		7	
8. Fender System		N	
a. Piles	N		
b. Diagonal Bracing	N		
c. Horizontal Bracing	N		
d. Wales	N		
e. Fasteners	N		
f. Ladders	N		

ITEM 59 *SUPERSTRUCTURE*
(If any part done by divers)

		DEF

ITEM 62 'N
CULVERTS

		DEF
1. Roof	N	
2. Floor	N	
3. Walls	N	
4. Headwall	N	
5. Wingwall	N	
6. Pipe	N	
7. Protective Coating	N	
8. Embankment	N	
9. Wearing Surface	N	
10. Railing	N	
11. Sidewalks	N	
12. Utilities	N	
13. Member Alignment	N	
14. Deformation	N	
15. Scour	N	
16. Settlement	N	

UNDERMINING (Y=Yes / N=No) N

DEFICIENCY REPORTING GUIDE

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency - Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete. Minor scouring, etc.

S= Severe/Major Deficiency - Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroding rebars, Deteriorated timber piles, Considerable settlement, Considerable scouring or undermining, etc.

C-S= Critical-Structural Deficiency - A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.

C-H= Critical-Hazard Deficiency - A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Any part of piles or fender system which are projecting outward and may become a safety hazard for the navigational traffic, etc.

URGENCY OF REPAIR:

I= Immediate- Inspector(s) immediately contact District Bridge Engineer to report the Deficiency and to receive further instruction from him/her].

A= As soon as possible- [Action/Repair should be initiated by District Maintenance Engineer or the responsible Party (if not a State owned bridge) upon receipt of the Inspection Report.]

P= Prioritize- [Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available].

N. N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

FILE

B

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTI
Boston	4T4	B-16-360	MTA 896 264 101	Augus

REMARKS & PHOTOS

General: The underwater elements of bridge are in good condition.
Beginning at the upstream end and extending downstream 32' +/-, the masonry ab
existing railroad bridge were utilized as a foundation for the concrete breastwall
masonry is 0.5' below the waterline.

Remarks:

ITEM 60

1.Abutments:

d. Breastwall - There is minor abrasion of the concrete at both abutments,from approximat
water to 0.5' below. Penetrations vary from 1/8" to 1/2". Avg. pen. is 1/4".
The waterline is 4.3' below the bridge seat at the downstream end of the Le
Left Abutment - The concrete patch below the 3.5'D outfall pipe at the d
is deteriorated,Max. Ht. 1.5', Max. Pen. 2'.

g. Pointing - Joints between granite masonry are generally tight, with a few isolated pene
0.2'.

h., j. Footing & Scour - No footing exposed. No apparent scour.

ITEM 61

6. Slope Protection - Slope paving at downstream end only.
7. Aggradation - Minor soil deposit in channel.

June 6, 2000

State Information

9 4 FHWA Select List= N

AASHTO= 028.0

Identification

per BRI896194100
a
Department District 04
025 (4) Place code 07000
sected WATER MUDDY RIVER
d HWY BROOKLINE AV
nt 0000.000
Network N
Route & Subroute
00 DEG 00 MIN 00.00 SEC
00 DEG 00 MIN 00.00 SEC
State Code Share %
Structure No. #

Structure Type and Material

e Main: Code ???
Jointless bridge type:
e Appr:
Code ???
ns in main unit 000
roach spans 0000
re Type - Code ?
ace / Protective System:
ing surface - Bituminous Code 6
brane - None Code 0
protection - None Code 0

Age and Service

1850
tructed 1900
: On - Highway
erway Code 15
ucture 00 Under structure 00
Traffic 000000
2000 (109) Truck ADT 00 %
length 000 KM

Geometric Data

mum span 0000.0 M
th 00004.6 M
lk: Left 00.0 M Right 00.0 M
Width Curb to Curb 000.0 M
t to Out 000.0 M
lway Width (w/shoulders) 000.0 M
- Code ?
0 DEG (35) Structure Flared N
MIN Vert Clear 00.00 M
Total Horiz Clear 00.0 M
Over Bridge Rdwy 00.00 M
rclear ref N 00.00 M
ear RT ref N 00.0 M
lear LT 00.0 M

Navigation Data

trol - No navigation control on waterway Code 0
n Code
ical Clearance 000.0 M
Nav Min Vert Clear M
zontal Clearance 0000.0 M

Classification

Classification		Code
(112) NBIS Bridge Length		N
(104) Highway System		N
(26) Functional Class -	Urban Local	19
(100) Defense Highway		1
(101) Parallel Structure		?
(102) Direction of Traffic -		?
(103) Temporary Structure		N
(105) Federal Lands Highways		0
(110) Designated National Network		N
(20) Toll -		
(21) Maintain -		
(22) Owner -		
(37) Historical Significance	listed	H

Condition

Condition	Code
(58) Deck	?
(59) Superstructure	?
(60) Substructure	?
(61) Channel & Channel Protection	?
(62) Culverts	?

Load Rating and Posting

Load Rating and Posting		Code
(31) Design Load -		?
(63) Operating Rating Method	Allowable Stress (AS)	2
(64) Operating Rating		00.0
(65) Inventory Rating Method -	Allowable Stress (AS)	2
(66) Inventory Rating		00.0
(70) Bridge Posting		0
(41) Structure -	Open	A

Appraisal

Appraisal	Code
(67) Structural Evaluation	N
(68) Deck Geometry	3
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	
(72) Approach Roadway Alignment	
(36) Traffic Safety Features	
(113) Scour Critical Bridges	6

Inspections

(90) Inspection Date 00/00/00 (91) Frequency 24 MO

(92) Critical Feature Inspection:				(93) CFI DATE
(A) Fracture Critical Detail	N	00	MO A)	00/00/00
(B) Underwater Inspection	N	00	MO B)	00/00/00
(C) Other Special Inspection	N	00	MO C)	00/00/00
(*) Other Inspection	N	00	MO *)	00/00/00
(*) Closed Bridge	N	00	MO *)	00/00/00
(*) Damage Inspection			MO *)	00/00/00

Loads

Date 00/00/00	H20	Type 3	Type 3S2	Type HS
Operating	00	00	00	00
Inventory	00	00	00	00

Posting

Status Date 00/00/00
2 Axle 3 Axle 5 Axle

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel N Jointless Bridge

Accessibility

N	Liftbucket	N	Rigging	Inspection	
N	Ladder	N	Staging	Hours:	06
N	Boat	N	Traffic Control		
N	Wader	N	RR Flagperson		
N	Inspector 50	N	Police		

Report Date: June 6, 2000

State Information

BDEPT#=B16195 FHWA Select List= N

Town=Boston

B.I.N=8QU AASHTO= 040.0

Identification

(8) Structure Number CUL896195100

(5) Inventory Route

(2) State Highway Department District 04

(3) County Code 025 (4) Place code 07000

(6) Features Intersected WATER MUDDY RIVER

(7) Facility Carried HWY WILLOW PND R

(9) Location

(11) Kilometerpoint 0000.016

(12) Base Highway Network N

(13) LRS Inventory Route & Subroute

(16) Latitude 42 DEG 19 MIN 30.00 SEC

(17) Longitude 71 DEG 07 MIN 06.00 SEC

(98) Border Bridge State Code Share %

(99) Border Bridge Structure No. #

Structure Type and Material

(43) Structure Type Main: Masonry Code 819

Culvert Jointless bridge type:

(44) Structure Type Appr:

Other Code 000

(45) Number of spans in main unit 001

(46) Number of approach spans 0000

(107) Deck Structure Type - Code ?

(108) Wearing Surface / Protective System:

- A) Type of wearing surface - Bituminous Code 6
- B) Type of membrane - None Code 0
- C) Type of deck protection - None Code 0

Age and Service

(27) Year Built 1850

(106) Year Reconstructed 0000

(42) Type of Service: On - Highway

Under - Waterway Code 15

(28) Lanes: On Structure 02 Under structure 00

(29) Average Daily Traffic 000000

(30) Year of ADT 2000 (109) Truck ADT 00 %

(19) Bypass, detour length 002 KM

Geometric Data

(48) Length of maximum span 0001.2 M

(49) Structure Length 00006.1 M

(50) Curb or sidewalk: Left 00.0 M Right 00.0 M

(51) Bridge Roadway Width Curb to Curb 000.0 M

(52) Deck Width Out to Out 000.0 M

(32) Approach Roadway Width (w/shoulders) 000.0 M

(33) Bridge Median - No median Code 0

(34) Skew 00 DEG (35) Structure Flared Y

(10) Inventory Route MIN Vert Clear 99.99 M

(47) Inventory Route Total Horiz Clear 00.0 M

(53) Min Vert Clear Over Bridge Rdwy 99.99 M

(54) Min Vert Underclear ref N 00.00 M

(55) Min Lat Underclear RT ref N 00.0 M

(56) Min Lat Underclear LT 00.0 M

Navigation Data

(38) Navigation Control - No navigation control on waterway Code 0

(111) Pier Protection Code

(39) Navigation Vertical Clearance 000.0 M

(116) Vert-lift Bridge Nav Min Vert Clear M

(40) Navigation Horizontal Clearance 0000.0 M

Classification

(112) NBIS Bridge Length

(104) Highway System

(26) Functional Class - Urban Local

(100) Defense Highway

(101) Parallel Structure

(102) Direction of Traffic -

(103) Temporary Structure

(105) Federal Lands Highways

(110) Designated National Network

(20) Toll - On free road

(21) Maintain - Town Agency

(22) Owner - Town Agency

(37) Historical Significance undetermined

Condition

(58) Deck

(59) Superstructure

(60) Substructure

(61) Channel & Channel Protection

(62) Culverts

Load Rating and Posting

(31) Design Load - Other/Unknown

(63) Operating Rating Method Allowable Stress (AS

(64) Operating Rating

(65) Inventory Rating Method - Allowable Stress (AS

(66) Inventory Rating

(70) Bridge Posting

(41) Structure - Open

Appraisal

(67) Structural Evaluation

(68) Deck Geometry

(69) Underclearances, vert. and horiz.

(71) Waterway adequacy

(72) Approach Roadway Alignment

(36) Traffic Safety Features

(113) Scour Critical Bridges

Inspections

(90) Inspection Date 09/01/84 (91)

(92) Critical Feature Inspection:

- (A) Fracture Critical Detail N 00
- (B) Underwater Inspection N 00
- (C) Other Special Inspection N 00
- (*) Other Inspection N 00
- (*) Closed Bridge N 00
- (*) Damage Inspection

Loads

Date 00/00/00	H20	Type 3	Typ
Operating	00	00	
Inventory	00	00	

Posting

Status

2 Axle 3 Axle

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel

Accessibility

N	Liftbucket	N	Rigging
N	Ladder	N	Staging
N	Boat	N	Traffic Control
N	Wader	N	RR Flagperson
N	Inspector 50	N	Police

June 6, 2000

State Information

60	FHWA Select List=	Y
	AASHTO=	011.0

Identification

ber	MTA896264101
e	111000900
Department District	04
025 (4) Place code	07000
sected	WATER MUDDY RIVER
d	I 90
	.2 MI FENWAY PARK S53
nt	0213.458
Network	Y
Route & Subroute	
	42 DEG 20 MIN 51.99 SEC
	71 DEG 05 MIN 35.88 SEC
State Code	Share %
Structure No. #	

Structure Type and Material

e Main:	Steel	Code	302
	Jointless bridge type: Not applicable		
e Appr:			
		Code	000
ans in main unit			001
proach spans			0000
re Type -	Concrete Cast-in-Place	Code	1
face / Protective System:			
ing surface -	Bituminous	Code	6
brane -	None	Code	0
protection -	Epoxy Coated Reinforcing	Code	1

Age and Service

			1965
tructed			0000
e: On -	Highway		
terway		Code	15
ucture	04	Under structure	00
Traffic			101659
1997	(109) Truck ADT		12 %
length			005 KM

Geometric Data

mum span			0018.3 M
gth			00019.8 M
lk:	Left 01.1 M	Right	00.8 M
y Width Curb to Curb			014.6 M
t to Out			017.1 M
dway Width (w/shoulders)			014.6 M
- No median		Code	0
0 DEG	(35) Structure Flared		N
MIN Vert Clear			99.99 M
Total Horiz Clear			14.6 M
Over Bridge Rdwy			99.99 M
rclear ref	N		00.00 M
lear RT ref	N		00.0 M
lear LT			00.0 M

Navigation Data

trol - No navigation control on waterway	Code	0
n	Code	
ical Clearance		000.0 M
Nav Min Vert Clear		M
zontal Clearance		0000.0 M

Classification

		Code
(112) NBIS Bridge Length		Y
(104) Highway System		Y
(26) Functional Class -	Urban Interstate	11
(100) Defense Highway		1
(101) Parallel Structure		N
(102) Direction of Traffic -	2-way traffic	2
(103) Temporary Structure		N
(105) Federal Lands Highways		0
(110) Designated National Network		N
(20) Toll -	On toll road	2
(21) Maintain -	State Toll Authority	31
(22) Owner -	State Toll Authority	31
(37) Historical Significance	built after 1949 presumed to be not	Z

Condition

	Code
(58) Deck	7
(59) Superstructure	N
(60) Substructure	N
(61) Channel & Channel Protection	8
(62) Culverts	N

Load Rating and Posting

		Code
(31) Design Load -	HS 20	5
(63) Operating Rating Method	Allowable Stress (AS)	2
(64) Operating Rating		43.5
(65) Inventory Rating Method -	Allowable Stress (AS)	2
(66) Inventory Rating		32.7
(70) Bridge Posting		5
(41) Structure -	Open	A

Appraisal

	Code
(67) Structural Evaluation	9
(68) Deck Geometry	2
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	8
(72) Approach Roadway Alignment	8
(36) Traffic Safety Features	0 0 0 0
(113) Scour Critical Bridges	6

Inspections

(90) Inspection Date 02/10/99 (91) Frequency 24 MO

(92) Critical Feature Inspection:				(93) CFI DATE
(A) Fracture Critical Detail	N	00	MO A)	00/00/00
(B) Underwater Inspection	Y	60	MO B)	08/27/99
(C) Other Special Inspection	N	00	MO C)	00/00/00
(*) Other Inspection	N	00	MO *)	00/00/00
(*) Closed Bridge	N	00	MO *)	00/00/00
(*) Damage Inspection			MO *)	00/00/00

Loads

Date 00/00/00	H20	Type 3	Type 3S2	Type HS
Operating	00	00	00	00
Inventory	00	00	00	00

Posting

Status Date 00/00/00

2 Axle 3 Axle 5 Axle

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel N Jointless Bridge

Accessibility

N	Liftbucket	N	Rigging	Inspection	
N	Ladder	N	Staging	Hours:	06
N	Boat	N	Traffic Control		
N	Wader	N	RR Flagperson		
N	Inspector 50	N	Police		

BRIDGE RATING

PREPARED FOR

THE DEPARTMENT OF PUBLIC WORKS
COMMONWEALTH OF MASSACHUSETTS

BOSTON-BROOKLINE
NETHERLANDS ROAD

over

MUDDY RIVER

Bridge No. B-16-193=B-27-13
Bridge Key No. TWN-896-193-100

FRANCIS
X.
McGRATH
No. 25615

Date of Inspection: September 20, 1986
Date of Rating: June, 1988

BAYSIDE ENGINEERING ASSOCIATES, INC.
803 Summer Street, Boston, Massachusetts 02127

I N D E X

PTION SHEET

Evaluation Rating and Recommended Posting 1

on Map 2

ption of Bridge 3 - 4

Analysis Assumptions and Criteria 5

tion of Rating and Recommendations 6

ble Plans 7

Loadings 8

ix

IELD INSPECTOR REPORTS:

ption 9

tructures Inspection Field Report

HOTOGRAPHS

KETCHES

DGE EVALUATION RATING AND RECOMMENDED POSTING

Y	LOCATION	BRIDGE NO.	MAINTENANCE NO.
	NETHERLANDS ROAD over MUDDY RIVER	B-16-193=B-27-13	TWN 896-193-100

TYPE	INVENTORY RATING	OPERATING RATING	RECOMMENDED POSTING *
	20.0^T **	27.5^T **	
	25.0^T **	34.4^T **	
	36.0^T **	49.5^T **	

d Posting in tons.

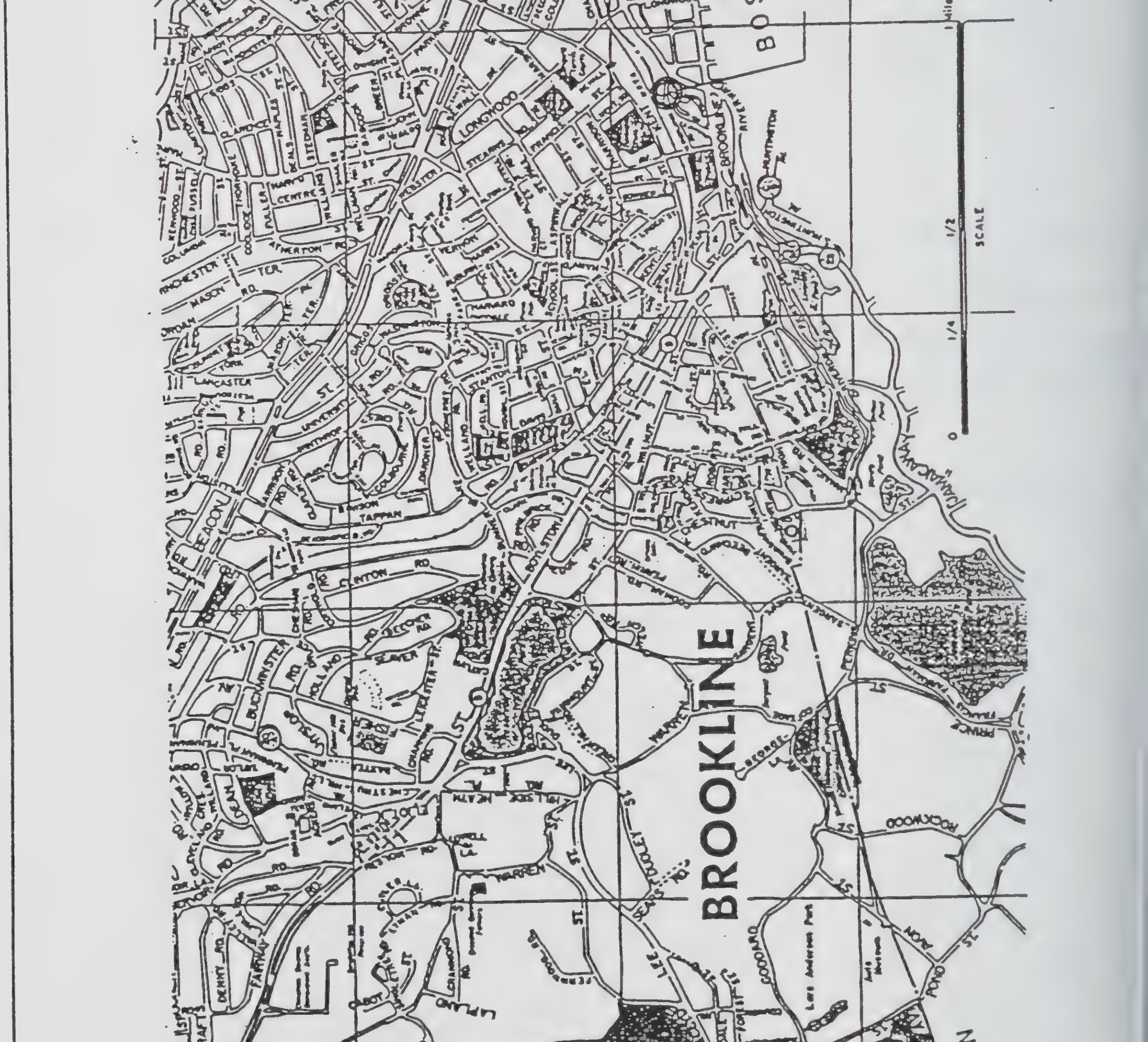
osting required if blank.

reater than Inventory Rating, equal to Load Factor Rating, or based on the
ving considerations, if any.

by "Engineering Judgment"

BRIDGE ENGINEER

DATE


CAMBRIDGE
Charles River
BOSTON
SITE
N
BROOKLINE
BOSTON
LONGWOOD
BEACON
BOYLSTON
CHESTNUT
HEATH
WARREN
CLINTON
TAPPAN
ROCKWOOD
POND ST.
0
1/4
1/2
1 Mile
SCALE
© Universal Publishing Co.

LOCUS PLAN

DESCRIPTION OF BRIDGE

ROOKLINE NETHERLANDS ROAD OVER MUDDY RIVER B-16-193=B-27-13

idge, built in 1892, is a single span arch bridge with a an of 44 feet and a rise of 16 feet (scaled) above the iling foundation. The arch is constructed of granite blocks 4 feet above the water line and the remainder of the arch with mortared red bricks. The wingwalls and sidewalk para- smooth granite and the curbstone and top of parapet are rfaced solid stone blocks with rounded corners and mortared

idge supports a 27′-4" roadway, one sidewalk about 7 feet a grass strip 7 feet wide on the north side. The structure verall width of 47′-4". The bridge was not posted at the the field visit.

ur visit, we found the condition of the bridge to be as

es: The bridge has good vertical alignment but sight is restricted by a horizontal curve and vegetation along approach roadway. The west approach is in good condition; approach has extensive map cracks.

Surface: The bituminous concrete pavement is in fair n with scattered random and map cracks.

Railing: The parapet railing is mortared granite stone ith a rough pointed stone cap which are in good condition some deterioration in the mortar joints. The pink-tinted s some small shrubs and vegetation growing in the joints.

Arch: There is heavy spalling and efflorescence of the the top of the soffit and near the granite fascia with some missing bricks adjacent to the fascia stones. Along the nort there is a continuous crack ranging from 2 feet to 4.5 feet i from the fascia. The crack juts into the granite at the top fascia and a piece of granite is about to fall off.

Overall the arch is in good condition with no bulges or depressions. Some minor repointing is needed on the fascia a wingwalls.

Substructure: Generally in good condition with some minor cr and missing mortar in joints of the abutments, wingwalls, and underside brick facing on the arch. No evidence of differe settlement. At both abutments, there is a horizontal "line" water leakage and efflorescence in the brick portion of the a about two feet above the intersection of granite blocks and f bricks.

RATING ANALYSIS ASSUMPTIONS AND CRITERIA

BROOKLINE NETHERLANDS ROAD OVER MUDDY RIVER B-16-193=B-27-13

on a review of inspection records and a site visit by Engineering Associates, Inc. personnel, the structure will d on the basis of "Engineering Judgment". In accordance with W Bridge Manual, Part I, Section N, revised in May 1987, which have been carrying normal traffic for many years signs of distress, and detailed design drawings are not le, may be rated by "Engineering Judgment" only. The subject re was built around 1892 and has carried normal traffic to thout signs of distress. The barrel arch stones and brick form a uniform surface and no displacement of individual was noted. Also, no cracks, evidence of excessive pressure stones or bricks, or vibrations or deflection under heavy oads was observed. In view of the lack of distress signs, we the structure will continue to support the standard truck s.

butments were not considered critical for rating purposes.

EVALUATION OF RATING AND RECOMMENDATIONS

BOSTON-BROOKLINE NETHERLANDS ROAD OVER MUDDY RIVER B-16-

On the basis of "Engineering Judgment", we believe that structure will continue to carry statutory loads without dis recommend that the bridge not be posted for H, Type 3 or Typ loadings.

General maintenance and inspection should continue at f intervals.

There are some mortar joints that are porous or the mor missing, particularly at the arch soffit on the north side. joints should be repaired and repointed in the near future.

Otherwise, the structure is in good condition at the pr and no repairs are recommended.

AVAILABLE PLANS

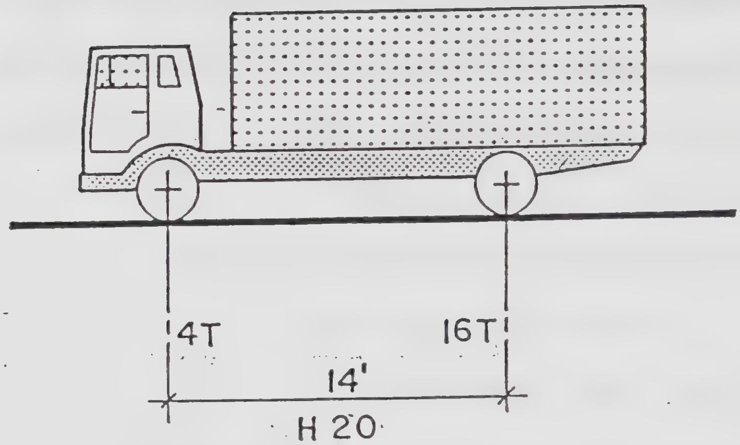
BROOKLINE NETHERLANDS ROAD OVER MUDDY RIVER B-16-193=B-27-13

copy of the following plan was made available by the Town of ne DPW to Bayside Engineering Associates, Inc. personnel for se in determining the live load capacity of the bridge.

PARK COMMISSIONERS
CITY OF BOSTON TOWN OF BROOKLINE
BELLEVUE ST. BRIDGE
DEC. 15, 1891
PLAN, ELEVATION OF SOUTH END AND SECTIONS

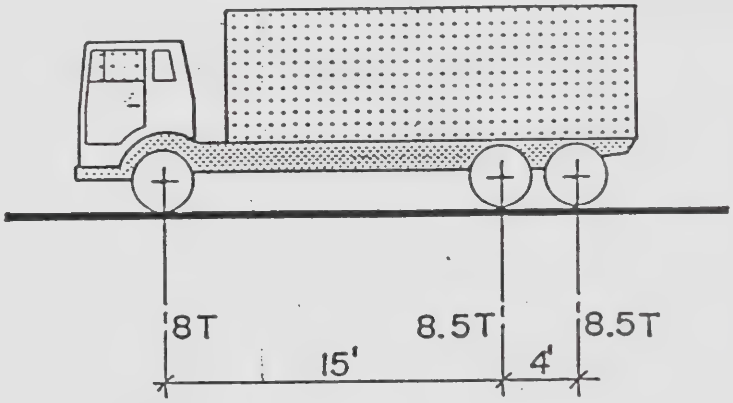
Massachusetts Bridge Rating

LIVE LOADINGS



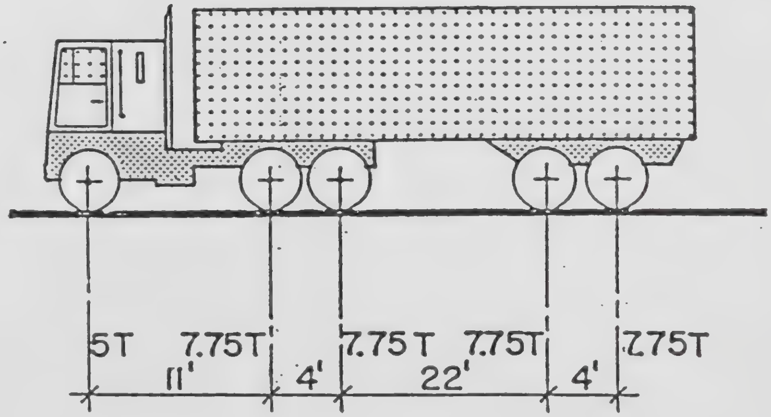
H 20

Total Weight
20 Tons



Type 3

Total Weight
25 Tons



Type 3-S2

Total Weight
36 Tons

SEE PLATE II - "MANUAL FOR MAINTENANCE INSPECTION OF

APPENDIX A

OPTION 9 SHEET

STRUCTURE INSPECTION FIELD REPORT

```
ON TYPE=NDEPTH         02-26-88

16193                                BRKEY=TWN896193100

WY    NTHRLNDS RD                    ITEM06=WATER MUDDY RIVER

                                     AASHTO= 744         RANK=1949



8              *ITEM28=0200         *ITEM51=0270         ITEM73=00
13             *ITEM29=001800        ITEM52=0473         ITEM74=0
89              ITEM30=84           *ITEM53=9999         ITEM75=000
51000000        ITEM31=0             ITEM54=0000         ITEM76=000000
999            *ITEM32=027           ITEM55=999          ITEM77=0
0001            ITEM33=0             ITEM56=000          ITEM78=000C
000             ITEM34=00            ITEM57=2            ITEM79=00
                ITEM35=0            *ITEM58=N            ITEM80=00000C
0000           *ITEM36=0000         *ITEM59=5            ITEM81=00
00              ITEM38=0            *ITEM60=6            ITEM82=0C
2202            ITEM39=000           ITEM61=6            ITEM83=0
71067           ITEM40=0000         *ITEM62=N            ITEM84=00000
                ITEM41=A             ITEM63=20           ITEM85=000
1               ITEM42=55            ITEM64=             ITEM86=000
               *ITEM43=811           ITEM65=4            ITEM87=00000
                ITEM44=000          *ITEM66=             ITEM88=0C0C0
                ITEM45=001          *ITEM67=6            ITEM89=*
                ITEM46=0000         *ITEM68=5            ITEM90=092C86
2               ITEM47=270          *ITEM69=N            ITEM91=
                ITEM48=0036          ITEM70=6            ITEM92=025
6               ITEM49=000044       *ITEM71=6            ITEM93=0570
000             ITEM50=150000       *ITEM72=4            ITM90A=
                                                         ITEM94=
```

MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

NDEPTH

STRUCTURES INSPECTION FIELD REPORT

-BROOKLINE	DIST. 08	BRIDGE PLAN NO. B-16-193=B-27-13	BRIDGE KEY NO. TWN 896193100
OLK	STRUCTURE TYPE BRICK AND STONE MASONRT ARCH (DECK)		
TEM TREET	ITEM 07 INVENTORY ROUTE NETHERLANDS ROAD	ITEM 06 FACILITY UNDER MUDDY RIVER	
YEAR REBUILT	OWNER CITY/TOWN	INSPECTOR BARNES AND JARNIS, INC. RRS/EMM/TSB	DATE INSP. 9/20/86

face	5
dition	N
	7
	N
	5
	6
-SONRY	6
[illegible])	N
ndards	N
	N
	N
ab	N
nt	7

EM 58 N

TROLS ☒

TROLS ☐

SUPERSTRUCTURE

1. Bearing Devices	N
2. Stringers	N
3. Diaphragms	N
4. ~~Girders or Beams~~ BRICK ARCH	5
5. Floor Beams	N
6. Trusses - General	N
- Portals	N
- Bracing	N
7. Rivets or Bolts	N
8. Welds - Cracks	N
9. ~~Concrete~~ MORTAR Cracking	5
10. Collision Damage	7
11. Load Deflection	8
12. Member Alignment	N
13. Load Vibration	7
14. Paint - Epoxy	N
15. Year Painted	N

ITEM 59 5

CONDITION CONTROLS ☒

CAPACITY CONTROLS ☐

SUBSTRUCTURE

1. Abutments — Wings	7
— Backwall	N
— Brestwall	6
— Footings	—
— Piles	N
— Erosion	6
— Settlement	7
2. Piers or Bents — Caps	N
— Column	N
— Web	N
— Footing	N
— Piles	N
— Scour	N
— Settlement	N
3. Pile Bents	N
4. ~~Concrete~~ MORTAR Cracks or Spalls	6
5. Debris on Seats	N
6. Collision Damage	7
7. Adequacy - Hydraulically	7

ITEM 60 6

CONDITION CONTROLS ☒

CAPACITY CONTROLS ☐

NG RATING

	H	3	3S2
(Tons)	—	—	—

66 INVENTORY RATING

	H	3	3S2
(Tons)	—	—	—

ADING

	H	3	3S2
ding (Tons)	—	—	—

	H
ding (Tons)	—

SIGNS

1. Legibility	—
2. Visibility	—
3. Missing (Y-yes; N-no)	
(A) At Bridge	—
(B) Advance	—

RALPH R. SALVUCCI No. 27120

Ralph

NOTE: Condition Ratings are to be obtained from appropriate pages from latest copy of the FHW Inventory and Appraisal of the Nations Bridge

FIC SAFETY FEATURES

	ITEM 36	CONDITION
ing *	0	6
	0	N
ardrail	0	N
ardrail Terminal	0	N

RT PARAPET

CHANNEL & CHANNEL PROTECTIO

1. Channel Scour	7
2. Embankment Erosion	7
3. Fender System	N
4. Spur Dikes & Jetties	N
5. Rip Rap	N
6. Effectiveness	7
7. Debris	6
8. Vegetation	6

ITEM 61 6

REMARKS — SKETCHES — PHOTOGRAPHS

TRUSS TYPE (Item 43A) ☐

TAR LOSS ON FASCIAS AND WINGWALLS. NEEDS SOME REPOINTING

ALLING OF BRICK SOFFIT PARTICULARLY NEAR FASCIAS, WITH

ENTS, SOME MISSING BRICK ADJACENT TO GRANITE FASCIA STONES.

ING' OF LEAKAGE AND EFFLORESCENCE IN BRICK PORTION OF ARCH

.FEET ABV. INTERSECTION OF GRANITE BLOCKS AND BRICK, BOTH SIDES.

E OF ARCH SOFFIT HAS HEAVY CRACKING FOLLOWING FASCIA, CRACK

FROM ABT 2' TO 4 1/2' IN FROM FASCIA AND EFFECT BOTH FASCIA GRANITE

CK SOFFIT. LARGE SPALL IN BRICK AT TOP OF SOFFIT WHERE

UTS INTO GRANITE; PIECE OF GRANITE ABOUT TO SPALL OFF. CRACK

IT AT TOP OF SOFFIT AND FEATHERS OUT TO NOTHING IN AREA BETW

CTION OF BRICK ARCH AND ABUT GRANITE BLOCKS JUST ABOVE

NE.

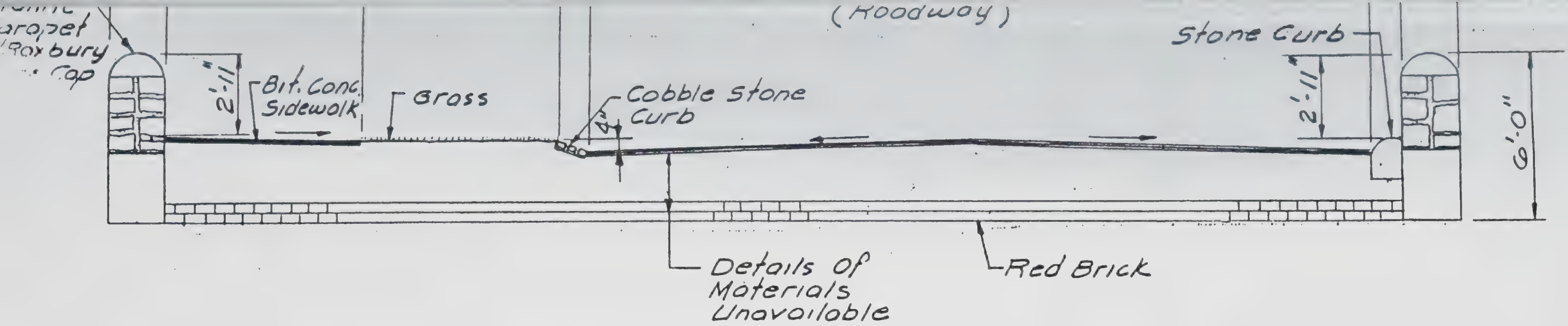
WING BETW BIT CONC SIDEWALK AND PARAPET ON NORTH SIDE MAY BE

KING TO LEAKAGE INTO ARCH SOFFIT.

SOUTH ELEVATION

APPENDIX C

SKETCHES

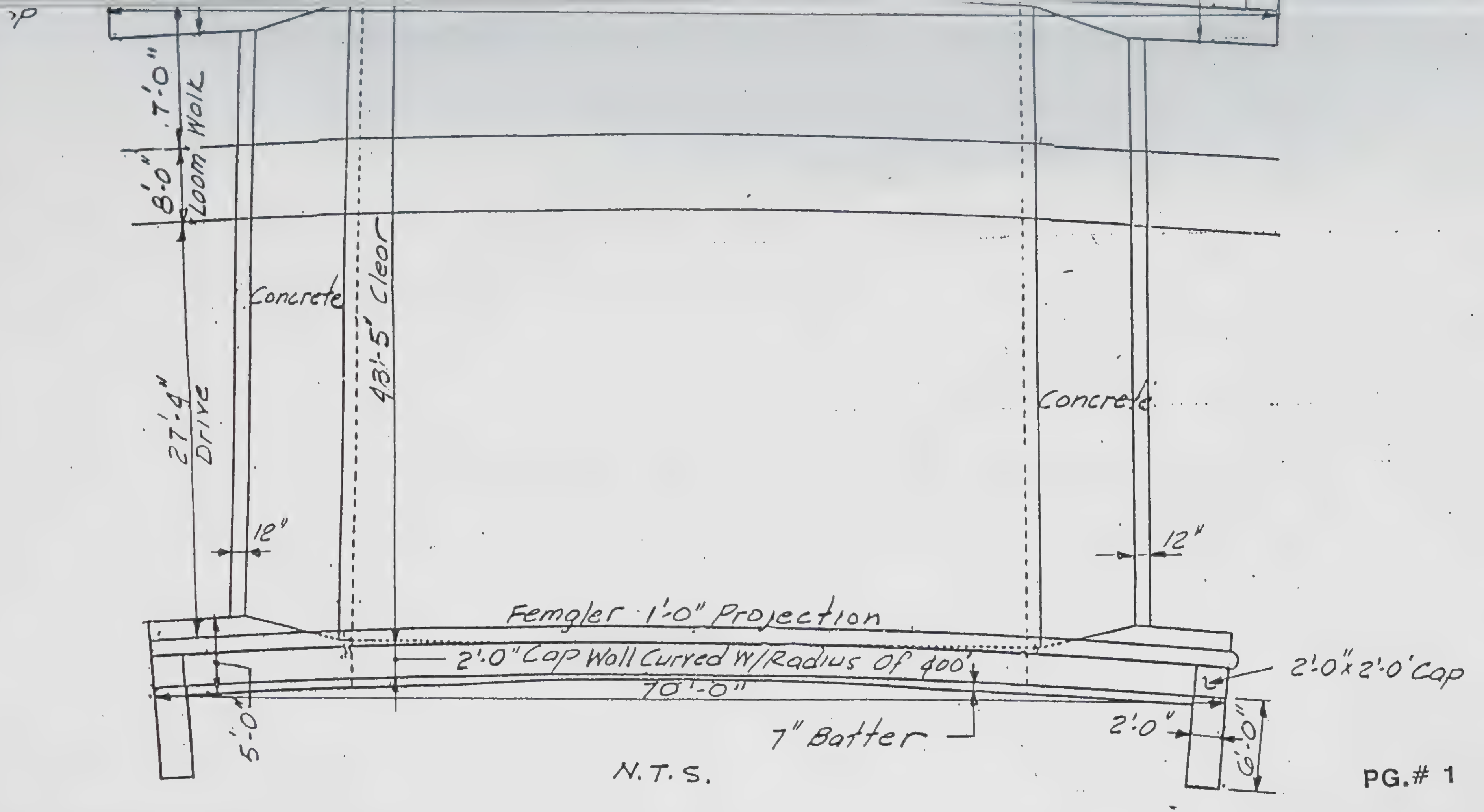


NOTE: All Dimensions Field Measured

SECTION AT CROWN

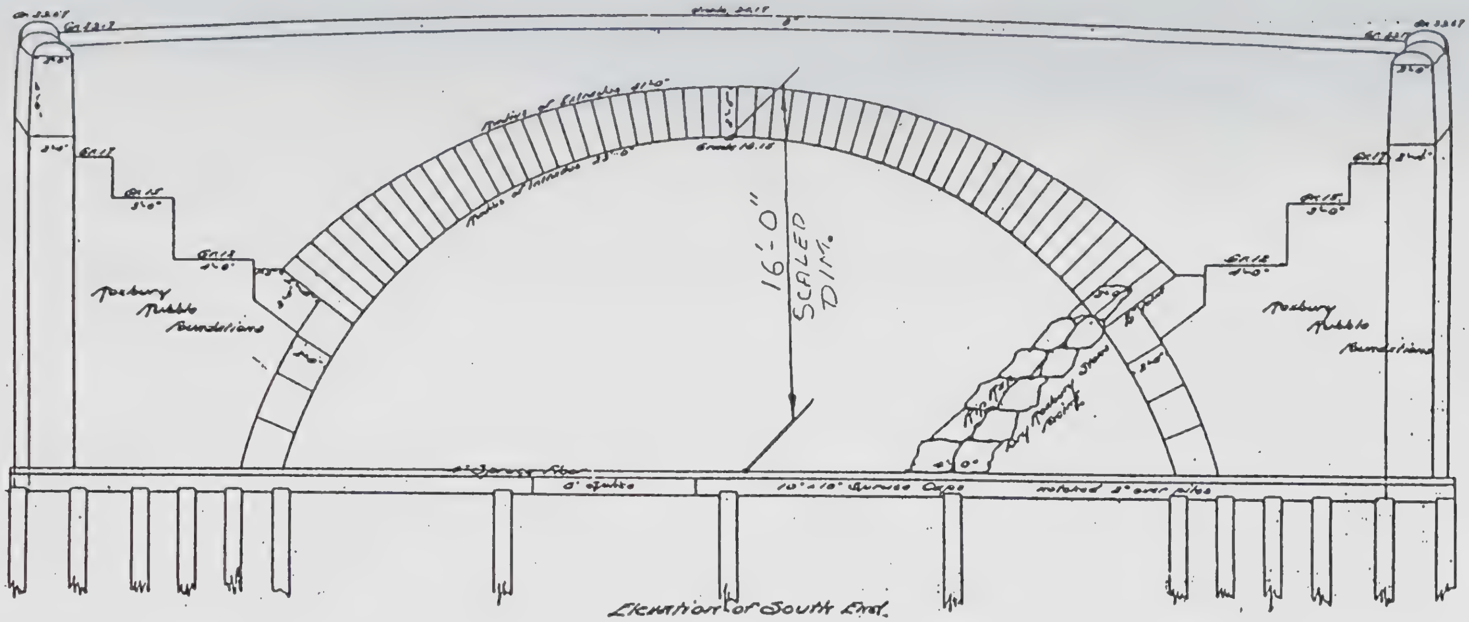
PG. #3

BOSTON-BROOKLINE NETHERLANDS ROAD OVER MUDDY RIVER	SECTION	B-16-193= B-27-13.



PG.# 1

BOSTON-BROOKLINE NETHERLANDS ROAD OVER MUDDY RIVER	PLAN	B-16-193= B-27-13



Elevation of South End.

PG. # 2

BOSTON-BROOKLINE NETHERLANDS ROAD OVER MUDDY RIVER	ELEVATION	B-16-193= B-27-13

Element Data Collection Form

Month	Day	Year
4	14	2000

idge Number B-16-189

Town BOSTON

BIN 391

District 4

dge Key Number TWN 896 189 100

Inspectors BONICA — Leader; DESMOND, COLLERAN — Member; MHD - U/W OPNS — Agency/Consultant/Dept. Name

	Units	Env-iron.	Total Quantity	Condition States (Quantity or Percent) *					Q or P *
				1	2	3	4	5	
LL	M	2	100		100				Q
IT	M	2	49.4		49.4				Q

etween Quantity and Percent for different Elements.

MASSACHUSETTS HIGHWAY DEPARTMENT
STRUCTURES INSPECTION FIELD REPORT
ROUTINE ARCH INSPECTION

PAGE 1 OF 16
BR. DEPT. NO. B16-189

8-STRUCTURES NO. TWN 396 189 100	11-MILE POINT 000.020	41-STATUS A	90-ROUTINE INSP DATE 0397

ssiz Rd.

MEMORIAL NAME/LOCAL NAME N	27-YR BUILT 1889	106-YR REBUILT 0000	YR REHAB'D (NON 106 X

TED
uddy River

26-FUNCTIONAL CLASS. Urban Local

DIST. BRIDGE INSPECTION ENGINEER Douglas J. Costantino

CONSULTANT'S STAMP:

Arch - Deck

22-OWNER City/Mun

21-MAINTAINER City/Mun

TEAM LEADER Francis P. Collins

WEATHER Sunny, mild.

TEMP[a] 50°

TEMP[c] N

TEAM MEMBERS E. Ray

	N	DEF
	6	m/P
	N	
	7	
	7	
	N	
	8	
	6	m/P
	N	
e	N	
	N	
ds	N	
	N	
	N	

NE 3"

SW 3"

		DEF
ion	7	
nent	7	
nent	7	

(Y/N) N

		DEF
	N	
	N	
	N	

ITEM 59 6

SUPERSTRUCTURE

		DEF
1. Arch/Arch Ring	6	m/P
2. Keystone Area	6	m/P
3. Stringers/Tee Beams	N	
4. Floor Beams	N	
5. Spandrel Walls	6	m/P
6. Spring Lines	7	
7. Diaphragms	N	
8. Conn Plt's, Gussets& Angles	N	
9. Hangers	N	
10. Masonry Joints	6	m/P
11. Rivets & Bolts	N	
12. Welds	N	
13. Deformation/Flattening	7	
14. Member Alignment	6	m/P
15. Paint/Coating	N	
16.		
Year Painted:	N	

COLLISION DAMAGE: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

LOAD DEFLECTION: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

LOAD VIBRATION: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

Any Fracture Critical Member? (Y/N) N

Any Cracks? (Y/N) N If YES please explain

ITEM 60 6

SUBSTRUCTURE

			DEF
1. Abutments		H	
a. Wingwalls	6		m/P
b. Backwalls	N		
c. Breastwalls	H		
d. Bridge Seats	N		
e. Pedestals	N		
f. Footings	H		
g. Piles	X		
2. Piers or Bents		H	
a. Caps	H		
b. Pedestals	N		
c. Columns	H		
d. Webs	H		
e. Footings	H		
f. Piles	X		
3. Pile Bents		N	
a. Piles	N		
b. Diagonal Bracing	N		
c. Horizontal Bracing	N		
d. Fasteners	N		
4. Settlement		7	
5. Pointing		H	
6. Erosion		7	
7. Debris on Seats		N	
8. Slope Paving		N	
9.			
10.			

COLLISION DAMAGE: Please explain
None (✓) Minor ( ) Moderate ( ) Severe (

UNDERMINING (Y/N): If YES please explain N

SCOUR: Please explain
None (✓) Minor ( ) Moderate ( ) Severe (

ITEM 60 FROM U/W INSP. 7

93b-U/W INSP DATE: 3/28/96

N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

(W)

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	90- IN
Boston	391	B16-189	TWN 896 189 100	03

ITEM 61 CHANNEL & CHANNEL PROTECTION 7

		DEF
1. Channel Scour	7	
2. Embankment Erosion	7	
3. Debris	6	
4. Vegetation	8	
5. Utilities	N	
6. Hydraulic Adequacy	7	
7. Spur Dikes & Jetties	N	
8. Rip Rap & Slope Protection	N	
9. Fender System	N	
10. Effectiveness/Alignment	7	

STREAM FLOW VELOCITY: Stagnant

Tidal ( ) High ( ) Moderate ( ) Low (✓)

ITEM 61 FROM U/W INSP. 5

93b-U/W INSP. DATE 3/28/96

ITEM 36 TRAFFIC SAFETY

	36	COND	DEF
1. Bridge Railing	N		
2. Transitions	N		
3. Approach Guardrail	N		
4. Approach Guardrail Ends	N		

WEIGHT POSTING: Not Applicable NR

	H	3	3S2	SINGLE
Actual Posting	—	—	—	—
Recommended Posting from Rating Book	—	—	—	—

Waived Date:

EJDMT Date: 00/00/1988

	At bridge N/E	At bridge S/W	Advance N/E	Advance S/W
Signs In Place (Y=Yes N=No)	—	—	—	—
Legibility/ Visibility	—/—	—/—	—/—	—/—

CLEARANCE POSTING: Not Applicable NR

water

	ft	in
Actual Field Measurement	—	—
Posted Clearance	—	—

	At bridge N/E	At bridge S/W	Advance N/E	Advance S/W
Signs In Place (Y=Yes N=No)	NR	NR	NR	NR
Legibility/ Visibility				

ACCES

Lift Buck

Ladder

Boat

Wader

Inspecto

Rigging

Staging

Traffic C

U/W Insp

RR Flagm

Police

Other:

TOTAL

PLANS:

(V.C.R.)

TAPE #:

List of Fiel

RATING:

Rating Report (Y/N): Y

Date: April 1988

Request for Rating or Rerating (Y/N): N

If YES please give priority:

HIGH ( ) MEDIUM ( ) LOW ( )

Reason:

CONDITION RATING GUIDE

(For Items 58, 59, 60 and 61)

	CODE	CONDITION	DEFECTS
	N	NOT APPLICABLE	
G	9	EXCELLENT	Excellent condition.
G	8	VERY GOOD	No problem noted.
G	7	GOOD	Some minor problems.
F	6	SATISFACTORY	Structural elements show some minor deterioration.
F	5	FAIR	All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
P	4	POOR	Advance section loss, deterioration, spalling or scour.
P	3	SERIOUS	Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures in steel or shear cracks in concrete may be present.
C	2	CRITICAL	Advance deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective actio
C	1	"IMMINENT" FAILURE	Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movemen Bridge is closed to traffic but corrective action may put it back in light service.
	0	FAILED	Out of service - beyond corrective action.

DEFICIENCY REPORTING GUIDE

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency -(Examples include but are not limited to: Spalled concrete, minor pot holes, minor corrosion to steel, minor scouring, clogge guardrail, etc.)

S= Severe/Major Deficiency - (Examples include but are not limited to: Large spalls, wide cracks, moderate to major deterioration in concrete, considerable scouring or undermining, moderate to extensive corrosion to steel, etc.)

C= Critical Deficiency - A deficiency in a structural component or element of a bridge that poses an extreme hazard or unsafe condi (Follow-Up Critical Deficiency Report must be submitted separately)

URGENCY OF REPAIR:

I= Immediate, (Inspector(s) stay at the bridge until District Maintenance crew or the responsible Agency crew (if not a State bridge) show up and correctiv

A= As soon as possible, (Action will be taken by District Maintenance Engineer or the Responsible Agency (if not a State owned bridge) upon receipt

P= Prioritize, (Shall be prioritized by District Maintenance Engineer or the Responsible Agency (if not a State owned bridge) and repairs be made w available).

B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION DATE
391	B16-189	TWN-896-189-100	0397

REMARKS, PHOTOS & SKETCHES

: Traffic Safety Features

-1 (Bridge Railing) Masonry stone acts as the railing. (Historic bridge)

-2, 3, 4, none

58 Deck

-1 (Wearing Surface) Bituminous surface has Areas of minor "D" cracking and transverse cracking near the crown of bridge.

7 (Parapets / Coping) Several small tree roots and vegetation at joint areas. (See photo on pg. 7)

reveal : 3" reveal only on the slanted granite curbs.

(A)

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPEC
Boston	391	B16-189	TWN-896-189-100	03

REMARKS, PHOTOS & SKETCHES

Item 59 Superstructure

59-1 (Arch/Arch Ring) Typical cond
the ends of each of
5 barrels, with brick disin
and chipping about 5' in
the ends of the barre
This is typical at both e
each barrel.

59-2 (Keystone Areas) Vegetation at
mortared joints near
keystone areas. Voids in
mortared joints also.
(See photo on pg. 7)

59-5 (Spandrel Walls) Vegetation and
tree roots in several
(See photo on pg. 7)

59-10 (masonry Joints) minor voids
joints at the brick arch
Several voids on masonry
throughout.

59-14 (member Alignment) Several mason
are misaligned. Old 1889

B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION DATE
391	B16-189	TWN-896-189-100	0397

REMARKS, PHOTOS & SKETCHES

60 Sub Structure

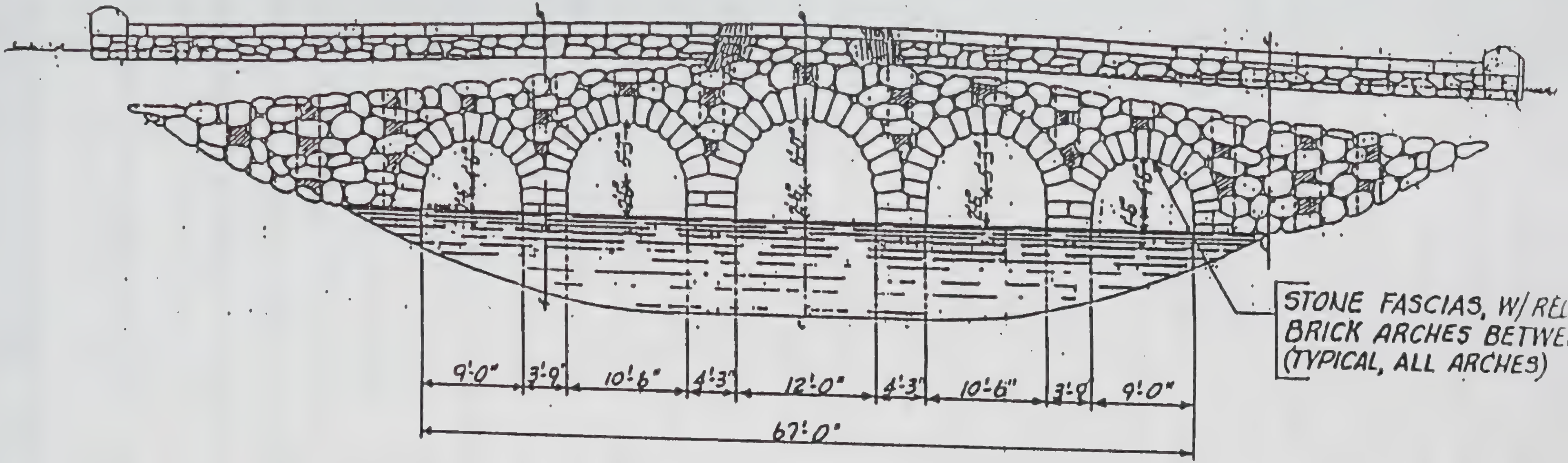
te : Most features are under the water level. Refer to underwater report of 3-28-96 attached.

0-1-a (Wingwalls) Several voids in the mortar joints throughout.

y/town Boston (A)

bridge dept. no. B-16-189

8-structure no. TWN-896-18



ELEVATION

NO SCALE

BOSTON B-16-189
AGASSIZ ROAD OVER
MUDDY RIVER

* [illegible] TAKEN [illegible]
[illegible]

H)

	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION DATE
	391	B16-189	TWN 896 189 100	0397

REMARKS & PHOTOS

'89 BIN (391)

al minor transverse and
acking on bituminous
ing surface.

B16-189 BIN (391)

(South Elevation).
Typical condition of stones with tree roots and vegetation in the joints.

MASSACHUSETTS HIGHWAY DEPARTMENT

UNDERWATER OPERATIONS TEAM

DIVERS ACTIVITY REPORT

bridge dept. no.
B-16-189

	5-facility carried Agassiz Road	6-features intersected Muddy River	93b-date inspected 3-28-96
8-structure no. TWN896189100	foundation type Unknown	dive master Joseph Donahue	
on	access to bridge Embankment	team members J. Fitzgerald; R. Bonica; A. Massery	

ns	water conditions Very dirty	depth 7'	visibility 0'	current Slight

0 (Underwater)	
cture	7
ments	
s	6
twall	7
ng	6
ngs	IA
	x
	8
rmining	NO
ement	7
or Bents	
	7
ng	6
n	NA
g	IA
	X
	8
mining	NO
ment	7
ents	
ete Piles	NA
r Piles	NA
al Bracing	NA
ntal Bracing	NA
ers	NA

rmining rated as YES or NO

4. Fender System

a.) Piles	NA
b.) Diagonal Bracing	NA
c.) Horizontal Bracing	NA
d.) Wales	NA
e.) Fasteners	NA
f.) Ladders	NA
g.)	
h.)	

Item 61 (Underwater) 5

Channel and Channel Protection

1. Debris	6
2. Aggradation	5
3. Utilities	X
4. Rip Rap	NA
5.	
6.	

Item 113 **Scour Critical Bridges**

Scour

a.) Footing Exposed	NO
b.) Undermining	NO

Scour Countermeasures

a.) Sheeting	NO
b.) Rip Rap	NO
c.) Other	NO

Y=YES N=NO

Submitted by: Alice Massery

OWN NA=NOT APPLICABLE IA=INACCESSIBLE Page [illegible] of [illegible]

Ⓐ

REMARKS, PHOTOS AND SKETCHES

city/town BOSTON	bridge dept. no. B-16-189	bin no.

This is a five (5) span arch structure, with granite abutments, bric
intrados and Roxbury pudding stone facia.

The under water elements appear to be in good condition. The pointi
good condition. In the areas of granite abutments and piers, there
areas of mortar loss with maximum penetration of 0.6'. In the areas
facia, the mortar has completely erroded from the joint between the
at the waterline.

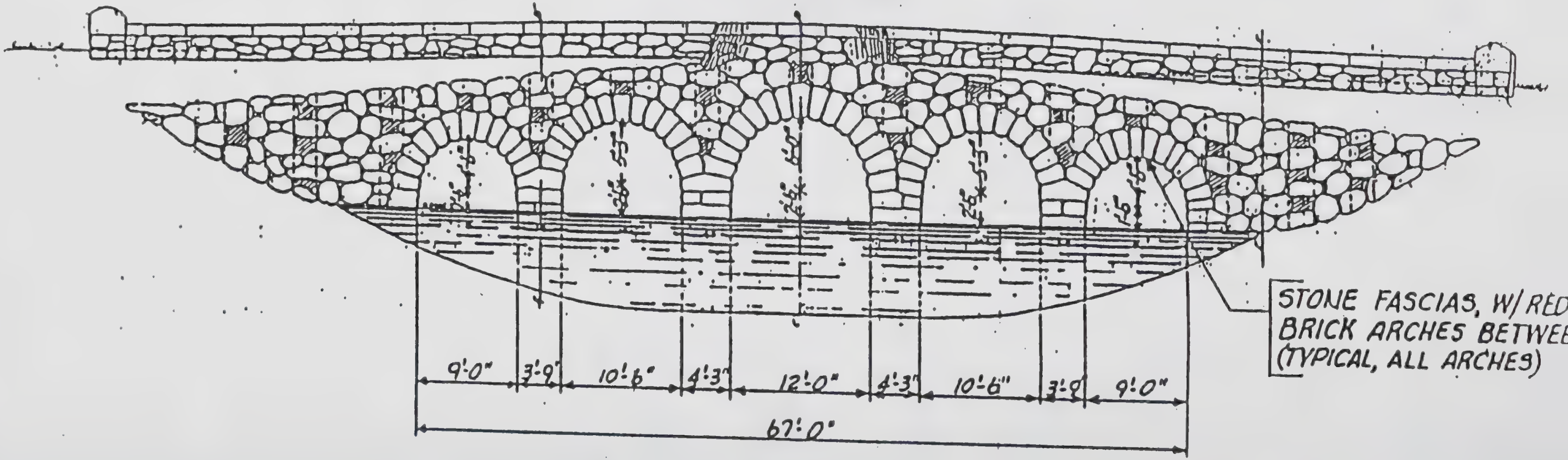
There is scattered debris(shopping carts, bicycle, glass, etc.) at th
downstream ends of the bridge.

bridge dept. no. B-16-189

8-structure no. TWN-874-189-100

90-date inspe 03-28-9

Pg. 13 of



ELEVATION
NO SCALE

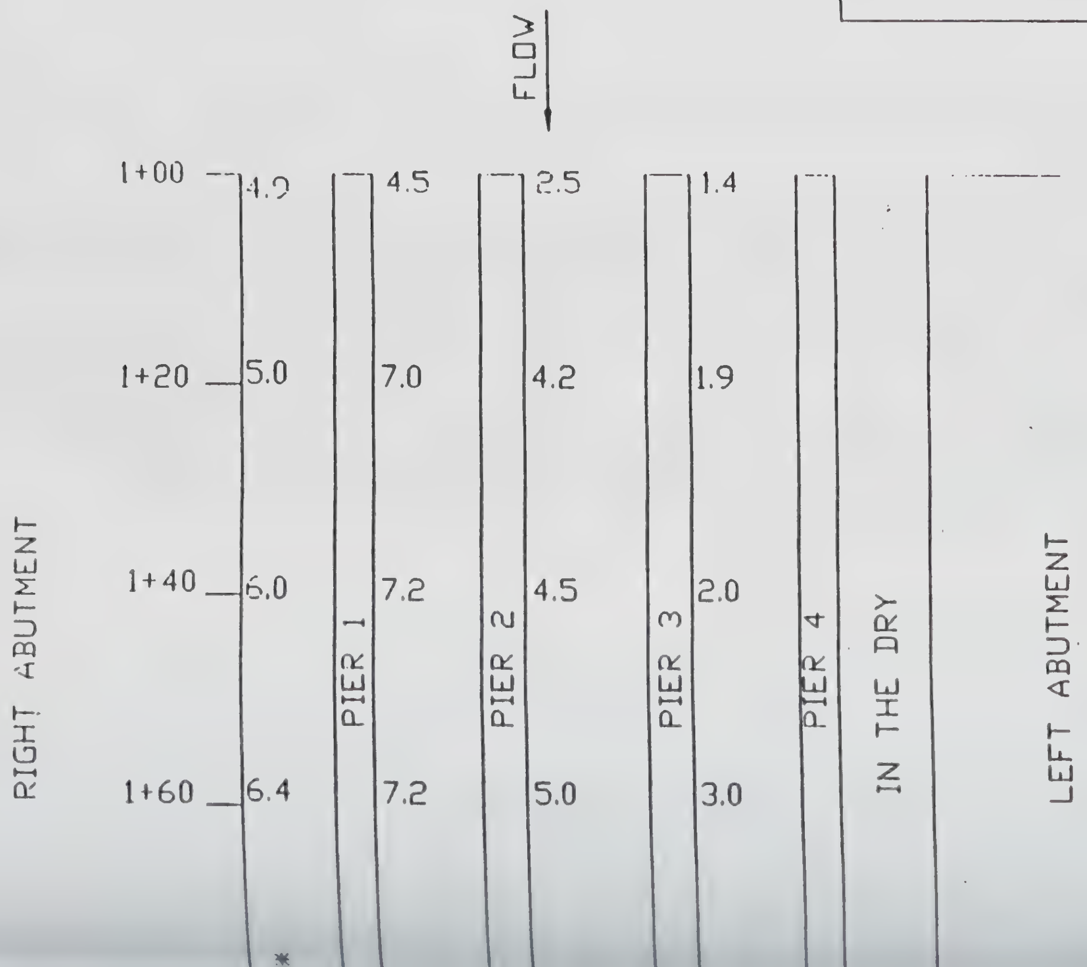
BOSTON B-16-189
AGASSIZ ROAD

A

SOUNDINGS-PLAN VIEW
N.T.S.

3/28/96

MASSACHUSETTS UNDERWATER OPERATIONS TEAM
B-16-189/BOSTON-MUDDY RIVER
PAGE____ OF____



	3/28/96									
RIGHT ABUTMENT	5.9									
PIER "1" LEFT SIDE	7.0									
PIER "2" LEFT SIDE	3.6									
PIER "3" LEFT SIDE	4.0									
"Y"	6.1									
CORRECTION FACTOR	—									

NOTES:

1) WATER CONTROL SHOT "Y", - WATERLINE TO APEX OF INTRADOS 6.1'.

2) All SOUNDINGS CORRECTED TO 1996 WATER LEVEL.

Town BOS

Bridge Number B-16-189

BIN 391

Bridge Key Number TWN 89

Ⓐ

Facility Carried AGASSIZ ROAD

Facility Under MUDDY RIVER

Date 3-28-96

Structure Type

Inspectors J. DONAHUE
Team Leader

J. Fitzgeral
Team Mem

em. #	Element Name	Units	Env-iron.	Total Quantity	Condition States (Quantity 1	2	3
1	MASONRY PIER WALL	LF	II	328	188	40	
7	MASONRY ABUTMENT	LF	II	162	142	20	

* It is okay to switch between Quantity and Percent for different Elements.

4/1997 (A)

Information *****************
N

AASHTO=093.3
fication *******************
TWN896189100
151000000
artment District 04
25 (4) Place code 07000
ted WATER MUDDY RIVER
HWY AGASSIZ RD
1.3 MI S OF RT 9
000.020
5 · (17) Longitude 071 D 05.7
te Code Share %
ucture No. #
ure Type and Material ********
n: Masonry
Code 811
r: Other
Code 000
main unit 005
spans 0000
e Code N
Protective System:
rface Code 6
Code N
ction Code 6
Service *******************
1889
0000
n - HWY-Ped
Code 55
re 01 Under Structure 00
fic 001571
95 (109) Truck ADT 06 %
gth 01 MI
c Data *******************
span 0012 FT
000060 FT
Left 15.5 FT Right 19.3 FT
h Curb to Curb 019.3 FT
ut 072.6 FT
dth (w/shoulders) 019 FT
Code 0
(35) Structure Flared 0
Vert Clear 99 FT 99 IN
al Horiz Clear 19.3 FT
Bridge Rdwy 99 FT 99 IN
ref N 00 FT 00 IN
RT ref N 99.9 FT
LT 00.0 FT
n Data ******************
Code 0
Code
Clearance 000 FT
v Min Vert Clear FT
al Clearance 0000 FT

********** Classification *************** Code
(112) NBIS Bridge Length Y
(104) Highway System - Off or STP 0
(26) Functional Class - Urban Local 19
(100) Defense Highway 0
(101) Parallel Structure N
(102) Direction of Traffic 1
(103) Temporary Structure
(110) Designated National Network 0
(20) Toll 3
(21) Maintain - City/Municipal 04
(22) Owner - City/Municipal 04
(37) Historical Significance H

********** Condition ******************* Code
(58) Deck N
(59) Superstructure 6
(60) Substructure 6
(61) Channel & Channel Protection ~~6~~ 7
(62) Culverts N

********** Load Rating and Posting ******* Code
(31) Design Load - Other/Unknown 0
(64) Operating Rating - Type 3S2 549
(66) Inventory Rating - Type 3S2 536
(70) Bridge Posting 5
(41) Structure - Open A

********** Appraisal ******************* Code
(67) Structural Evaluation 6
(68) Deck Geometry N
(69) Underclearances, vert. and horiz. N
(71) Waterway adequacy 7
(72) Approach Roadway Alignment 6
(36) Traffic Safety Features ~~0~~NNN
(113) Scour Critical Bridges 6

********** Inspections **********************
(90) Inspection Date ~~0295~~ 03;7 (91) Frequency 24 MO
(92) Critical Feature Inspection: (93) CFI DATE
(A) Fracture Critical Detail - N - MO A)
(B) Underwater Inspection - Y - 48 MO B) ~~1291~~ ~~[illegible]~~ 03/96
(C) Other Special Inspection - N - MO C)
(*) Critical Member - N MO *)
(*) Closed Bridge - N MO *)
(*) Damage Inspection - N/A MO *)

********** Loads ****************************

	H20	Type 3	Type 3S2	Type HS
Operating	127	434	549	
Inventory	120	425	536	

********** Posting **************************
Status EJDMT Date 00/00/1988
2 Axle 3 Axle 5 Axle

********** Bridge Specifics *****************
Bridge Name
Anti-missile fence N Acrow panel N

********** Accessibility ********************
Liftbucket N Rigging N Inspection
Ladder N Staging N Hours: ~~08~~ 12
Boat N Traffic Control N
Wader Y RR Flagman N
Inspector 50 N Police N

A

```
Report date: 04/17/1997

********** State Information *****************
FHWA Select List=N
BDEPT#=B16189
Town=Boston
B.I.N.=391                             AASHTO=093.3
********** Identification ********************
  (8) Structure Number                  TWN896189100
  (5) Inventory Route                      151000000
  (2) State Highway Department District           04
  (3) County Code     025    (4) Place code    07000
  (6) Features Intersected  WATER MUDDY RIVER
  (7) Facility Carried      HWY   AGASSIZ RD
  (9) Location              1.3 MI S OF RT 9
 (11) Milepoint                              000.020
 (16) Latitude 42 D 20.6   (17) Longitude 071 D 05.7
 (98) Border Bridge State Code           Share     %
 (99) Border Bridge Structure No.    #
     ********** Structure Type and Material ********
 (43) Structure Type Main: Masonry
        Arch-Deck                           Code 811
 (44) Structure Type Appr: Other
        Other                               Code 000
 (45) Number of spans in main unit               005
 (46) Number of approach spans                  0000
(107) Deck Structure Type                   Code   N
(108) Wearing Surface / Protective System:
   A) Type of wearing surface               Code   6
   B) Type of membrane                      Code   N
   C) Type of deck protection               Code   6
     ********** Age and Service *******************
 (27) Year Built                                1889
(106) Year Reconstructed                        0000
 (42) Type of Service: On - HWY-Ped
        Under - Waterway                    Code  55
 (28) Lanes:  On Structure   01   Under Structure  00
 (29) Average Daily Traffic                   001571
 (30) Year of ADT       97 (109) Truck ADT      06 %
 (19) Bypass, detour length                    01 MI
     ********** Geometric Data ********************
 (48) Length of maximum span                 0012 FT
 (49) Structure Length                     000060 FT
 (50) Curb or sidewalk:   Left 15.5 FT  Right 19.3 FT
 (51) Bridge Roadway Width Curb to Curb     019.3 FT
 (52) Deck Width Out to Out                 072.6 FT
 (32) Approach Roadway Width (w/shoulders)    019 FT
 (33) Bridge Median                           Code 0
 (34) Skew       00 DEG        (35) Structure Flared 0
 (10) Inventory Route MIN Vert Clear      99 FT 99 IN
 (47) Inventory Route Total Horiz Clear       19.3 FT
 (53) Min Vert Clear Over Bridge Rdwy     99 FT 99 IN
 (54) Min Vert Underclear ref          N  00 FT 00 IN
 (55) Min Lat Underclear RT ref        N      99.9 FT
 (56) Min Lat Underclear LT                   00.0 FT
     ********** Navigation Data *******************
 (38) Navigation Control                      Code 0
(111) Pier Protection                         Code
 (39) Navigation Vertical Clearance           000 FT
(116) Vert-lift Bridge Nav Min Vert Clear         FT
 (40) Navigation Horizontal Clearance        0000 FT

      ********** Classification **************** C
(112) NBIS Bridge Length
(104) Highway System - Off or STP
 (26) Functional Class - Urban Local
(100) Defense Highway
(101) Parallel Structure
(102) Direction of Traffic
(103) Temporary Structure
(110) Designated National Network
 (20) Toll
 (21) Maintain - City/Municipal
 (22) Owner - City/Municipal
 (37) Historical Significance
      ********** Condition ********************* Co
 (58) Deck
 (59) Superstructure
 (60) Substructure
 (61) Channel & Channel Protection
 (62) Culverts
      ********** Load Rating and Posting ******* Co
 (31) Design Load - Other/Unknown
 (64) Operating Rating - Type 3S2                  5
 (66) Inventory Rating - Type 3S2                  5
 (70) Bridge Posting
 (41) Structure - Open
      ********** Appraisal ********************* Co
 (67) Structural Evaluation
 (68) Deck Geometry
 (69) Underclearances, vert. and horiz.
 (71) Waterway adequacy
 (72) Approach Roadway Alignment
 (36) Traffic Safety Features                    NN
(113) Scour Critical Bridges
      ********** Inspections ************************
 (90) Inspection Date  0397     (91) Frequency  24
 (92) Critical Feature Inspection:      (93) CFI DAT
  (A) Fracture Critical Detail - N -        MO A)
  (B) Underwater Inspection    - Y - 48     MO B) 039
  (C) Other Special Inspection - N -        MO C)
  (*) Critical Member          - N          MO *)
  (*) Closed Bridge            - N          MO *)
  (*) Damage Inspection        - N/A        MO *)

      ********** Loads ******************************
                 H20    Type 3    Type 3S2   Type H
      Operating  127    434       549
      Inventory  120    425       536
      ********** Posting ****************************
      Status EJDMT                       Date 00/00/19
      2 Axle            3 Axle              5 Axle
      ********** Bridge Specifics *******************
      Bridge Name
      Anti-missile fence N                Acrow panel
      ********** Accessibility **********************
      Liftbucket   N   Rigging         N   Inspectio
      Ladder       N   Staging         N   Hours:  1
      Boat         N   Traffic Control N
      Wader        Y   RR Flagman      N
      Inspector 50 N   Police          N
```

Element Data Collection Form

Month	Day	Year
3		97

dge Number B16-189

BIN 391

lge Key Number TWN 896 189 100

Town BOSTON

District 4

Inspectors	F.COLLINS	E.RAY	M.H.D.
	Leader	*Member*	*Agency/Consultant/Dept. Name*

	Units	Env-iron.	Total Quantity	Condition States (Quantity or Percent) *					Q or P *
				1	2	3	4	5	
LK	EA	3	2	100					P
	LF	3	365	0	100				P

etween Quantity and Percent for different Elements.

BRIDGE RATING

PREPARED FOR

THE DEPARTMENT OF PUBLIC WORKS
COMMONWEALTH OF MASSACHUSETTS

BOSTON
AGASSIZ ROAD

over

MUDDY RIVER

Bridge No. B-16-189
Bridge Key No. TWN-896-189-100

ANCIS
RATH
25615

Date of Inspection: September 18, 1986
Date of Rating: April, 1988

BAYSIDE ENGINEERING ASSOCIATES, INC.
803 Summer Street, Boston, Massachusetts 02127

I N D E X

	SHEET
uation Rating and Recommended Posting	1
p	2
of Bridge	3-4
ysis Assumptions and Criteria	5
of Rating and Recommendations	6
lans	7
ngs	8

INSPECTOR REPORTS:
n 9
tures Inspection Field Report

GRAPHS

HES

E EVALUATION RATING AND RECOMMENDED POSTING

LOCATION	BRIDGE NO.	MAINTENANCE NO.
AGASSIZ ROAD over MUDDY RIVER	B-16-189	TWN 896-189-100

PE	INVENTORY RATING	OPERATING RATING	RECOMMENDED POSTING *
	20.0^T **	27.5^T **	
	25.0^T **	34.4^T **	
	36.0^T **	49.5^T **	

Posting in tons.

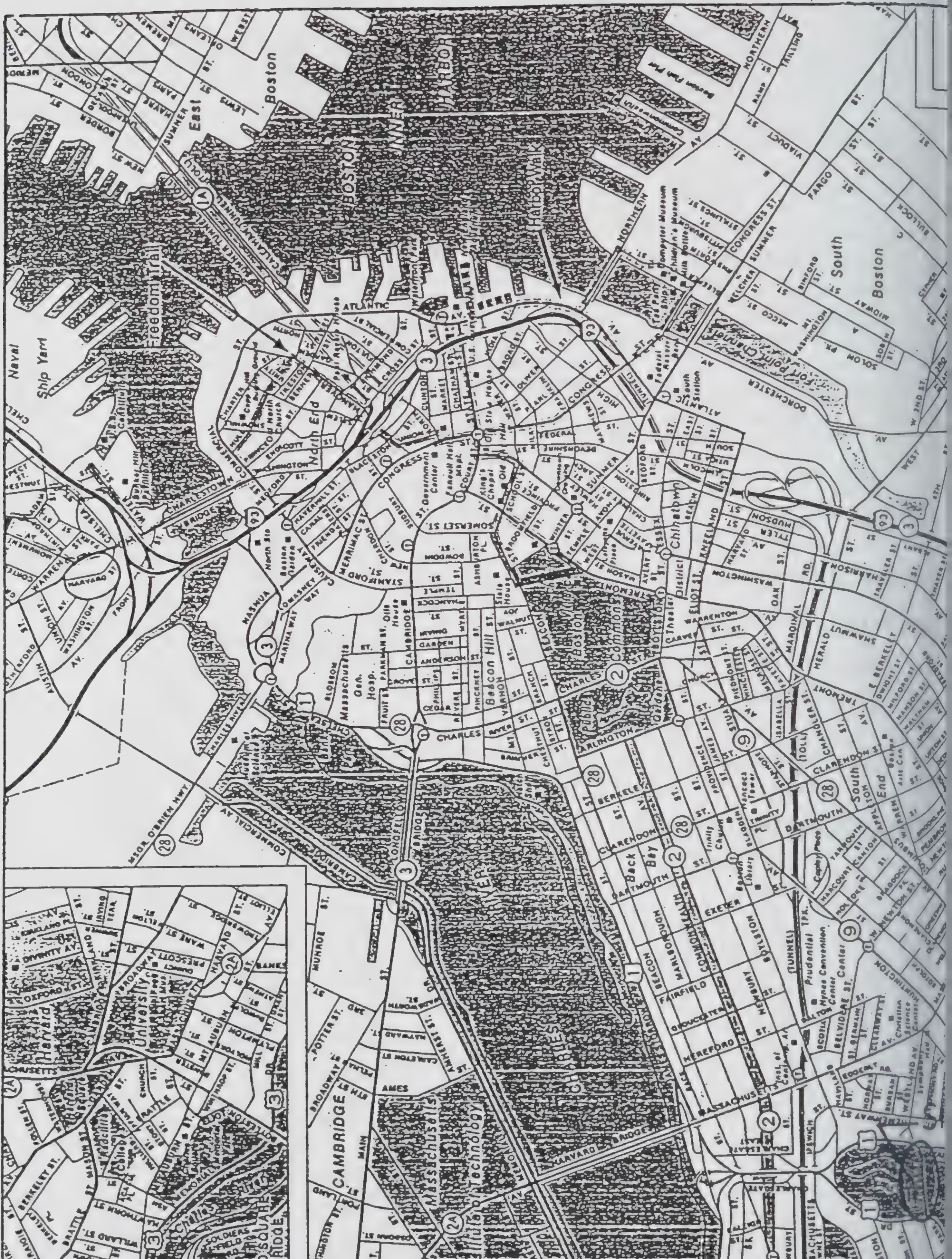
ting required if blank.

iter than Inventory Rating, equal to Load Factor Rating, or based on the
g considerations, if any.

by "Engineering Judgment"

BRIDGE ENGINEER

DATE



LOCUS PLAN

DESCRIPTION OF BRIDGE

AGASSIZ ROAD OVER MUDDY RIVER B-16-189

e No. B-16-189, built in 1887, is a five-span arch bridge symmetrical about the transverse centerline of bridge. er arch has a radius of 6'-0" and the adjacent barrels and els have a radii of 5'-3" and 4'-6", respectively. The believed to be mortared red bricks with earth fill between stone spandrels. Below the spring line, the arch is Roxbury stone blocks; otherwise, the remainder of the e and sidewalk parapets are rough-surfaced solid stone ith rounded corners and mortared joints.

ridge has a clear span of 67' with 4'-3" center piers and jacent piers. The water depth is 1 to 2 feet on the east over 6 feet deep on the west side.

ridge supports a 19.3-foot roadway, two sidewalks about 6 e and a grass strip 9 to 14 feet wide on each side. The e has an overall width of 72.6 feet. The bridge was not t the time of the field visit.

our visit, we found the condition of the bridge to be as

aches: The bridge has satisfactory horizontal and alignment. The approaches are in good condition.

ng Surface: The roadway was recently rebuilt (±1982) and od condition.

DESCRIPTION OF BRIDGE (Continued)

Parapet Railing: The parapet railing is mortared rough-surfaced stone blocks or Roxbury stones in good condition bu some deterioration in the mortar joints. The north stone pa rail has a 6 foot section missing over the middle barrels ar temporary Jersey barrier installed. There is some very minc shifting of the stones in the parapet.

Masonry Arch: Good condition but the general area should cleared of debris and shrubs. The masonry arch needs pointi has a few deteriorated bricks; however, overall the arch is good condition.

Substructure: Generally in good condition with some minc cracks and missing mortar in joints of the abutments, piers, underside brick facing on the arches.

RATING ANALYSIS ASSUMPTIONS AND CRITERIA

AGASSIZ ROAD OVER MUDDY RIVER B-16-189

on a review of inspection records and a site visit by
Engineering Associates, Inc. personnel, the structure will
on the basis of "Engineering Judgment". In accordance
e MDPW Bridge Manual, Part I, Section N, revised in May
ridges which have been carrying normal traffic for many
ithout signs of distress, and original design drawings are
ilable, may be rated by "Engineering Judgment" only. The
structure was built around 1887 and has carried normal
to date without signs of distress. The barrel arch stones
ck facing form a uniform surface and no displacement of
ual bricks was noted. Also, no cracks, evidence of
ve pressure between stones or bricks, or vibrations or
ion under heavy truck loads was observed. In view of the
distress signs, we believe the structure will continue to
the standard truck loadings.

abutments were not considered critical for rating purposes.

EVALUATION OF RATING AND RECOMMENDATIONS

BOSTON AGASSIZ ROAD OVER MUDDY RIVER B-

On the basis of "Engineering Judgment", we believe that t structure will continue to carry statutory loads without dis We recommend that the bridge not be posted for H, Type 3 or 3S2 unit loadings.

General maintenance and inspection should continue at fre intervals.

There are some mortar joints that are porous or the morta missing, particularly at the spring line. These joints shou repaired and repointed in the near future.

The bridge area is in need of a general clean up. The de and tree stumps at the north fascia should be removed. Any between the railing parapet and the masonry fascia should be removed because the roots may have an adverse effect on the masonry. The area is attractive and could be made more so.

Otherwise, the structure is in good condition at the pres time and no repairs are recommended.

AVAILABLE PLANS

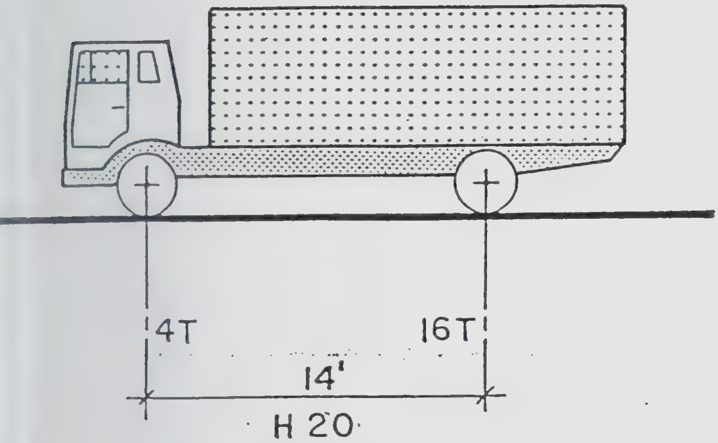
AGASSIZ ROAD OVER MUDDY RIVER B-16-189

ollowing plans were made available from the City of Boston
ayside Engineering Associates, Inc. personnel for their
etermining the live load capacity of the bridge.

CITY OF BOSTON - PARK DEPARTMENT
BACK BAY IMPROVEMENT
AGASSIZ ROAD BRIDGE
Soil Boring Logs
Plan of Piling July 22, 1887
Plan & Sections of Boulder Work
Elevation & Cross Sections
Stone & Coping Details

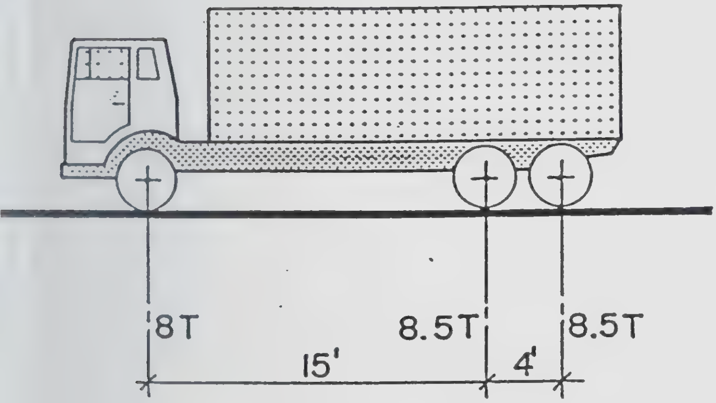
Massachusetts Bridge Rating

LIVE LOADINGS



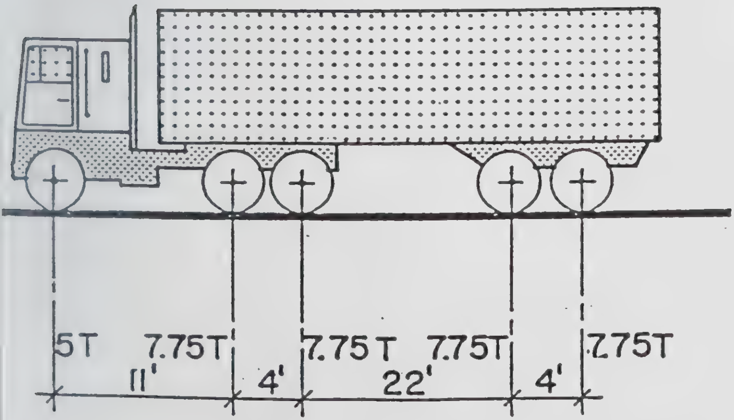
Total Weight
20 Tons ,

H 20



Total Weight
25 Tons

Type 3



Total Weight
36 Tons

Type 3-S2

TE 11 - "MANUAL FOR MAINTENANCE INSPECTION OF BRIDGES - 1983"

APPENDIX A

OPTION 9 SHEET

STRUCTURE INSPECTION FIELD REPORT

```
N TYPE=NDEPTH          02-26-88

6189                                    BRKEY=TWN896189100

Y   AGASSIZ RD                          ITEM06=WATER MUDDY RIVER

                                        AASHTO= 968           RANK=4377


                *ITEM28=0100           *ITEM51=0193            ITEM73=00
 3              *ITEM29=002400          ITEM52=0726            ITEM74=0
 6               ITEM30=84             *ITEM53=9999            ITEM75=000
 1000000         ITEM31=0               ITEM54=0000            ITEM76=000000
 99             *ITEM32=019             ITEM55=999             ITEM77=0
 002             ITEM33=0               ITEM56=000             ITEM78=0000
 00              ITEM34=00              ITEM57=2               ITEM79=00
                 ITEM35=0              *ITEM58=N               ITEM80=000000
 000            *ITEM36=0000           *ITEM59=6               ITEM81=00
 0               ITEM38=0              *ITEM60=6               ITEM82=00
 206             ITEM39=000             ITEM61=6               ITEM83=0
 1057            ITEM40=0000           *ITEM62=N               ITEM84=00000
                 ITEM41=A               ITEM63=20              ITEM85=000
                 ITEM42=55              ITEM64=                ITEM86=000
                *ITEM43=811             ITEM65=7               ITEM87=00000
                 ITEM44=000            *ITEM66=                ITEM88=00000
                 ITEM45=005            *ITEM67=6               ITEM89=*
                 ITEM46=0000           *ITEM68=7               ITEM90=091886
                 ITEM47=193            *ITEM69=N               ITEM91=
                 ITEM48=0012            ITEM70=6               ITEM92=025
                 ITEM49=000071         *ITEM71=7               ITEM93=0440
 00              ITEM50=155193         *ITEM72=7               ITM90A=
                                                               ITEM94=
```

MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

STRUCTURES INSPECTION FIELD REPORT

NDEPTH

OSTON	DIST. 8	BRIDGE PLAN NO. B-16-189	BRIDGE KEY NO. TWN 896 189 100

LK

STRUCTURE TYPE 5SPAN BRICK AND STONE MASONRY ARCH DECK

D SYSTEM TY STREET

ITEM 07 INVENTORY ROUTE AGASSIZ ROAD

ITEM 06 FACILITY UNDER MUDDY RIVER

YEAR REBUILT

OWNER CITY

INSPECTOR BARNES AND JARNIS, INC. RRS/ACP/FJP

DATE INSP. 9/18/86

CK

g Surface	6
Condition	N
LOPED GRANITE	7
	N
lks	7
t	6
g (SEE PARAPET)	N
	N
ng Standards	N
ies	N
oints	N
ch Slab	N
tlement	7

ITEM 58 N

N CONTROLS ☒

Y CONTROLS ☐

SUPERSTRUCTURE

1. Bearing Devices	N
2. Stringers	N
3. Diaphragms	N
4. ARCH SOFFITS ~~Girders or Beams~~	6
5. Floor Beams	N
6. Trusses - General	N
- Portals	N
- Bracing	N
7. Rivets or Bolts	N
8. Welds - Cracks	N
9. MORTAR ~~Concrete~~ Cracking	6
10. Collision Damage	7
11. Load Deflection	7
12. Member Alignment	N
13. Load Vibration	7
14. Paint - Epoxy	N
15. Year Painted	N

ITEM 59 6

CONDITION CONTROLS ☒

CAPACITY CONTROLS ☐

SUBSTRUCTURE

1. Abutments -- Wings	6
-- Backwall	N
-- Brestwall	6
-- Footings	—
-- Piles	—
-- Erosion	7
-- Settlement	7
2. Piers or Bents -- Caps	N
(SEE VEG. NOTE) -- ~~Column~~ (FASCIA WALLS)	5
-- Web (WALLS)	6
-- Footing	—
-- Piles	—
-- Scour	7
-- Settlement	7
3. Pile Bents	N
4. MASONRY SPALLS & MORTAR ~~Concrete Cracks or Spalls~~	6
5. Debris on Seats	N
6. Collision Damage	7
7. Adequacy - Hydraulically	6

ITEM 60 6

CONDITION CONTROLS ☒

CAPACITY CONTROLS ☐

RATING RATING

	H	3	3S2
(Tons)	—	—	—

66 INVENTORY RATING

	H	3	3S2
(Tons)	—	—	—

LOADING

	H	3	3S2
d Loading (Tons)	—	—	—

	H
e Loading (Tons)	—

RALPH R. SALVUCCI No. 2715

SIGNS

1. Legibility —
2. Visibility —
3. Missing (Y-yes; N-no)
   - (A) At Bridge —
   - (B) Advance —

NOTE: Condition Ratings are to be obtained from appropriate pages from latest copy of the FHWA "Recording & Coding Guide for the Structure Inventory and Appraisal of the Nations Bridges" and the "Massachusetts Coding Guide for Inventory, Inspection, and Appraisal of Bridges

36 TRAFFIC SAFETY FEATURES

	ITEM 36	CONDITION
1. Bridge Railing STONE MASONRY PARAPETS	0	6
2. Transitions	0	N
3. Approach Guardrail	0	N
4. Approach Guardrail Terminal	0	N

CHANNEL & CHANNEL

1. Channel Scour
2. Embankment Erosion
3. Fender System
4. Spur Dikes & Jetties
5. Rip Rap
6. Effectiveness
7. Debris
8. Vegetation

ITEM 61

REMARKS — SKETCHES — PHOTOGRAPHS

TRUSS TYPE (Item 4

– MORTAR JOINTS IN STONE MASONRY PARAPET HEAVILY ERRODED, & SOME STON

– SOME TRANSV DECK CRACKING OVER CENTER & EASTERLY SPANS.

– ARCH BARRELS ARE STONE AT FASCIAS & BRICK THROUGHOUT

EAST BARREL – MINOR BRICK SPALLING, SOME MISSING MORTAR @ SPRING LIN

r=4'-6" (CALLED 1st BARREL)

NOTE: WATER LEVEL 9" BELOW SPRING LINE & 5'-3" BELOW TOP OF G

r=5'-3" 2nd BARREL – MORE EROSION OF BRICK & MORTAR & SOME POURING MO

r=6'-0" 3rd BARREL – SIM. TO 2nd BARREL (MOST BRICK EROSION LOC. ABT 8' IN

r=5'-3" 4th BARREL – SIM TO 2nd & 3rd BARREL (SPRING LINE 21" ABV WTR –

r=4'-6" 5th BARREL – SIM TO 1st BARREL. (SPRING LINE 9" ABV WTR)

– CHANNEL DEPTHS VARY FROM 1 TO 3 FT @ EAST BARREL TO OVER 6' AT WE

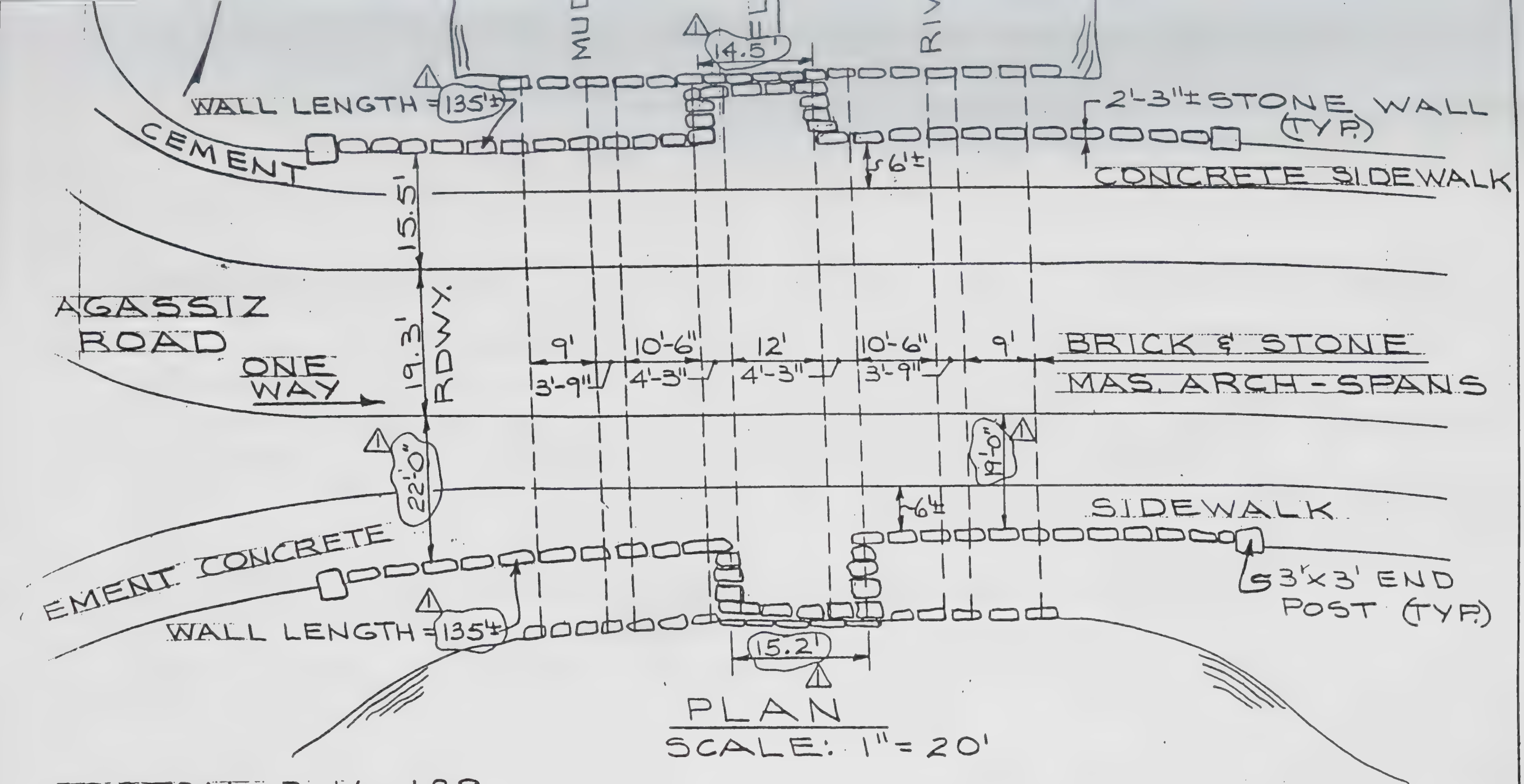
– DEBRIS MOST SEVERE AT NORTH FASCIA, SHOPPING CARTS, TREES.

NOTE – SPACE BETW MASONRY PARAPET AND MASONRY FASCIA WALLS OVERGROWN

& BUSHES. ROOTS ARE HAVING ADVERSE EFFECT ON MASONRY, PROBLEM WI

APPENDIX C

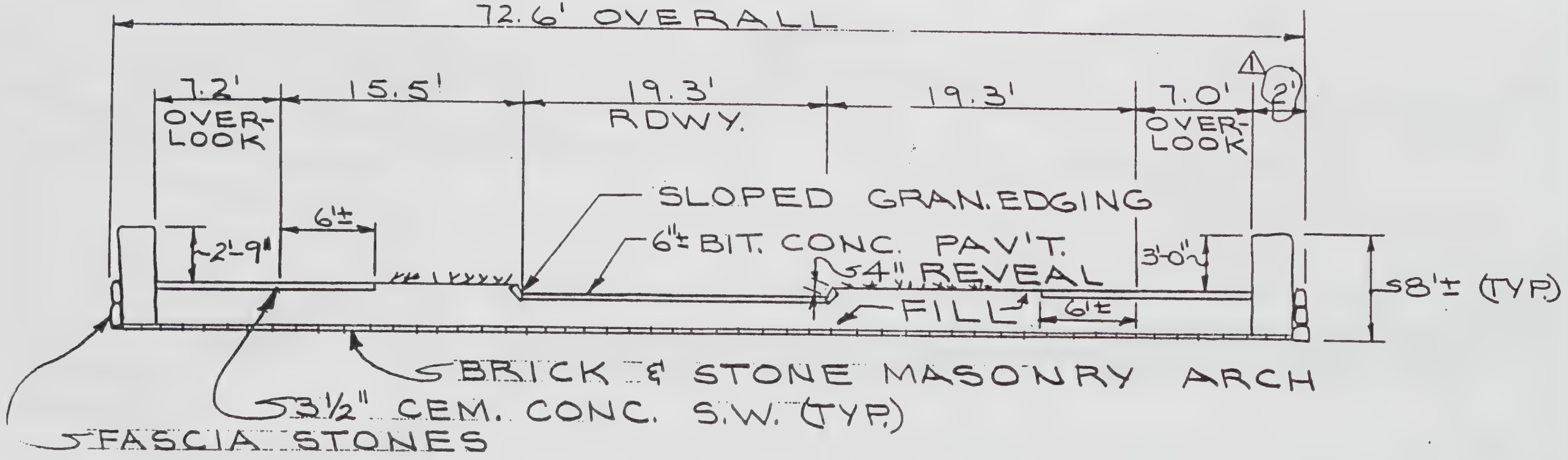
SKETCHES



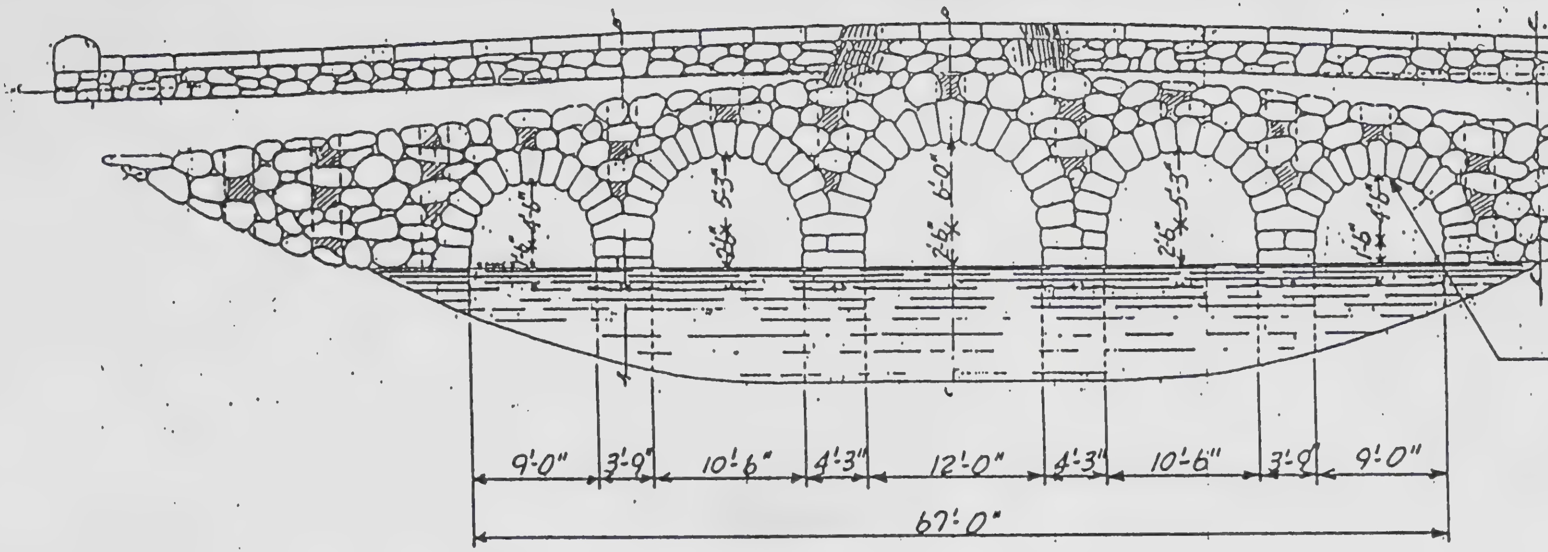
PLAN
SCALE: 1" = 20'

BOSTON B-16-189
AGASSIZ ROAD OVER
MUDDY RIVER
FIELD MEASURED: OCT. 16, 1984

⚠ REVISED 11-24-86
SHEET 1 OF 3



SECTION THROUGH CENTER ARCH
LOOKING EAST
SCALE: 1" = 10'



STONE FASCIAS, W/ RED
BRICK ARCHES BETWEE
(TYPICAL, ALL ARCHES)

ELEVATION

NO SCALE

BOSTON B-16-189
AGASSIZ ROAD OVER
MUDDY RIVER

SHEET 3 OF 3

une 6, 2000

State Information

FHWA Select List= N

AASHTO= 092.8

Identification

	TWN896189100
	151000000
partment District	04
025 (4) Place code	07000
ed	WATER MUDDY RIVER
	HWY AGASSIZ RD
	2.1 KM S OF RT 9
	0000.032
twork	Y
ute & Subroute	
	42 DEG 20 MIN 34.86 SEC
	71 DEG 05 MIN 40.43 SEC
te Code	Share %
ucture No. #	

Structure Type and Material

ain: Masonry	Code	811
Jointless bridge type: Not applicable		
ppr:		
	Code	000
in main unit		005
ach spans		0000
Type - Not applicable	Code	N
e / Protective System:		
surface - Bituminous	Code	6
ne - Not applicable=no deck	Code	N
otection - Polymer Impregnated	Code	6

Age and Service

		1889
cted		0000
On - Highway-Ped		
way	Code	55
ure 01	Under structure	00
affic		002200
1999 (109) Truck ADT		05 %
ngth		002 KM

Geometric Data

m span		0003.7 M
		00020.4 M
Left 02.0 M	Right	01.8 M
Vidth Curb to Curb		005.9 M
Out		022.1 M
ay Width (w/shoulders)		005.8 M
No median	Code	0
DEG (35) Structure Flared		N
IIN Vert Clear		99.99 M
otal Horiz Clear		05.9 M
er Bridge Rdwy		99.99 M
ear ref	N	00.00 M
r RT ref	N	00.0 M
r LT		00.0 M

Navigation Data

l - No navigation control on waterway	Code	0
	Code	
l Clearance		000.0 M
av Min Vert Clear		M
ntal Clearance		0000.0 M

Classification		Code
(112) NBIS Bridge Length		Y
(104) Highway System		Y
(26) Functional Class -	Urban Arterial	14
(100) Defense Highway		0
(101) Parallel Structure		N
(102) Direction of Traffic -	1-way traffic	1
(103) Temporary Structure		N
(105) Federal Lands Highways		0
(110) Designated National Network		N
(20) Toll -	On free road	3
(21) Maintain -	City/Municipal Highway A	04
(22) Owner -	City/Municipal Highway A	04
(37) Historical Significance	listed	H

Condition	Code
(58) Deck	N
(59) Superstructure	6
(60) Substructure	7
(61) Channel & Channel Protection	5
(62) Culverts	N

Load Rating and Posting		Code
(31) Design Load -	Other/Unknown	0
(63) Operating Rating Method	Allowable Stress (AS)	2
(64) Operating Rating		44.1
(65) Inventory Rating Method -	Allowable Stress (AS)	2
(66) Inventory Rating		32.4
(70) Bridge Posting		5
(41) Structure -	Open	A

Appraisal	Code
(67) Structural Evaluation	6
(68) Deck Geometry	2
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	7
(72) Approach Roadway Alignment	6
(36) Traffic Safety Features	0 0 0 0
(113) Scour Critical Bridges	8

Inspections

(90) Inspection Date 03/19/99 (91) Frequency 24 MO

(92) Critical Feature Inspection:				(93) CFI DATE
(A) Fracture Critical Detail	N	00	MO A)	00/00/00
(B) Underwater Inspection	Y	48	MO B)	04/14/2000
(C) Other Special Inspection	N	00	MO C)	00/00/00
(*) Other Inspection	N	00	MO *)	00/00/00
(*) Closed Bridge	N	00	MO *)	00/00/00
(*) Damage Inspection			MO *)	00/00/00

Loads

Date 00/00/00	H20	Type 3	Type 3S2	Type HS
Operating	28	34	50	49
Inventory	20	25	36	36

Posting

Status EJDMNT Date 04/01/88

2 Axle 3 Axle 5 Axle

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel N Jointless Bridge

Accessibility

N	Liftbucket	N	Rigging	Inspection	
N	Ladder	N	Staging	Hours:	12
Y	Boat	N	Traffic Control		
Y	Wader	N	RR Flagperson		
N	Inspector 50	N	Police		

ROUTINE ARCH INSPECTION

B16-188

N ST.	8-STRUCTURES NO. MDC496048	11-MILE POINT 000.570	41-STATUS A	90-ROUTINE INSP DATE 11-17-99

ED RIVER	MEMORIAL NAME/LOCAL NAME Boylston BR.	27-YR BUILT 1881	106-YR REBUILT —	YR REHAB'D (NON 106) —

ARCH	26-FUNCTIONAL CLASS URBAN ... C		DIST. BRIDGE INSPECTION ENGINEER David L Lenhardt	CONSULTANT'S STAMP:
	22-OWNER MDC	21 MAINTAINER M	TEAM LEADER R.E.	
EC Fill	WEATHER Pt Cloudy	TEMP(f) 40 / TEMP(c) —	TEAM MEMBERS M. GRIFFIN	

	DEF
N	
6	
N	
7	1
7	1
7	1
7	1
7	1
7	1
N	1
N	1
N	1
N	1
N	1

VE	S/W
8	8

	DEF
7	1
7	1
7	1

(Y/N) N

	DEF
N	1
N	1
N	1

ITEM 59

SUPERSTRUCTURE 5

		DEF
1. Arch/Arch Ring	5	M-P
2. Keystone Area	5	1
3. Stringers/Tee Beams	N	1
4. Floor Beams	N	1
5. Spandrel Walls	7	1
6. Spring Lines	6	1
7. Diaphragms	N	1
8. Conn Plt's, Gussets& Angles	N	1
9. Hangers	N	1
10. Masonry Joints	6	1
11. Rivets & Bolts	N	1
12. Welds	N	1
13. Deformation/Flattening	7	1
14. Member Alignment	N	1
15. Paint/Coating	N	1
16.		

Year Painted: —

COLLISION DAMAGE: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

LOAD DEFLECTION: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

LOAD VIBRATION: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

Any Fracture Critical Member? (Y/N) N

—

Any Cracks? (Y/N) N If YES please explain

ITEM 60

SUBSTRUCTURE 7

		DEF
1. Abutments	7	▨
a. Wingwalls *	7	1
b. Backwalls	N	1
c. Breastwalls	7	1
d. Bridge Seats	N	1
e. Pedestals	N	1
f. Footings	H	1
g. Piles	H	1
2. Piers or Bents	N	▨
a. Caps	N	1
b. Pedestals	N	1
c. Columns	N	1
d. Webs	N	1
e. Footings	N	1
f. Piles	N	1
3. Pile Bents	N	▨
a. Piles	N	1
b. Diagonal Bracing	N	1
c. Horizontal Bracing	N	1
d. Fasteners	N	1
4. Settlement *	7	1
5. Pointing	7	1
6. Erosion	7	1
7. Debris on Seats	N	1
8. Slope Paving	7	1
9.		
10.		

COLLISION DAMAGE: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

UNDERMINING (Y/N) : If YES please explain N

SCOUR: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

ITEM 60 FROM U/W INSP. 7

93b-U/W INSP DATE: 123197

N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

CITY/TOWN	B.L.N.	BR. DEPT. NO.	8-STRUCTURE NO.	90- INS
Boston	4FC	8	DC896098100	1

ITEM 61 CHANNEL & CHANNEL PROTECTION 7

		DEF
1. Channel Scour	6	
2. Embankment Erosion	7	
3. Debris	7	
4. Vegetation	7	
5. Utilities	N	
6. Hydraulic Adequacy	7	
7. Spur Dikes & Jetties	N	
8. Rip Rap & Slope Protection	7	
9. Fender System	N	
10. Effectiveness/Alignment	7	

STREAM FLOW VELOCITY:
Tidal ( ) High ( ) Moderate ( ) Low (✓)

ITEM 61 FROM U/W INSP. 7

93b-U/W INSP. DATE 123197

ITEM 36 TRAFFIC SAFETY

	36	COND	DEF
1. Bridge Railing	1	1	
2. Transitions	0	1	
3. Approach Guardrail	0	1	
4. Approach Guardrail Ends	0	1	

WEIGHT POSTING: *Not Applicable* ☑

	H	3	3S2	SINGLE
Actual Posting:		—	—	1
Recommended Posting from Rating Book	—	—	—	1

Waived Date: — EJDMT Date: —

	At bridge N/E	At bridge S/W	Advance N/E	Advance S/W
Signs In Place (Y=Yes N=No)	—	—	—	—
Legibility/ Visibility	—	—	—	—

CLEARANCE POSTING: *Not Applicable* ☑

	h	h
Actual Field Measurement	—	—
Posted Clearance	—	—

	At bridge N/E	At bridge S/W	Advance N/E	Advance S/W
Signs In Place (Y=Yes N=No)	—	—	—	—
Legibility/ Visibility	—	—	—	—

ACCESS
- Lift Buck
- Ladder
- Boat
- Wader
- Inspector
- Rigging
- Staging
- Traffic Co
- U/W Inspe
- RR Flagm
- Police
- Other:

TOTAL

PLANS:

(V.C.R.):
TAPE #:

List of Field
VISUA

RATING:
Rating Report (Y/N): Y
Date: 080288

Request for Rating or Rerating (Y/N): N
If YES please give priority:
HIGH ( ) MEDIUM ( ) LOW ( )

Reason:

CONDITION RATING

	CODE	CONDITION	DEFECTS
	N	NOT APPLICABLE	
G	9	EXCELLENT	Excellent condition.
G	8	VERY GOOD	No problem noted.
G	7	GOOD	Some minor problems.
F	6	SATISFACTORY	Structural elements show some minor deterioration.
F	5	FAIR	All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
P	4	POOR	Advance section loss, deterioration, spalling or scour.
P	3	SERIOUS	Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures in steel or shear cracks in concrete may be present.
C	2	CRITICAL	Advance deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective actio
C	1	"IMMINENT" FAILURE	Major deterioration or section loss present in critical structural components or obvious vertical or horizontal moveme Bridge is closed to traffic but corrective action may put it back in light service.
	0	FAILED	Out of service - beyond corrective action

DEFICIENCY REPORTING

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M- Minor Deficiency -(Examples include but are not limited to Spalled concrete, minor pot holes, minor corrosion to steel, minor scouring, clogge guardrail, etc.)

S- Severe/Major Deficiency - (Examples include but are not limited to: Large spalls, wide cracks, moderate to major deterioration in concrete considerable scouring or undermining, moderate to extensive corrosion to steel, etc.)

C- Critical Deficiency - A deficiency in a structural component or element of a bridge that poses an extreme hazard or unsafe cond (Follow-Up Critical Deficiency Report must be submitted separately)

URGENCY OF REPAIR:

I- Immediate, (Inspector(s) stay at the bridge until District Maintenance crew or the responsible Agency crew (if not a State bridge) show up and correctiv

A- As soon as possible, (Action will be taken by District Maintenance Engineer or the Responsible Agency (if not a State owned bridge) upon receipt

P- Prioritize, (Shall be prioritized by District Maintenance Engineer or the Responsible Agency (if not a State owned bridge) and repairs be made wh available)

B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION DATE
4FC	B16 188	MDC896098100	11-17-99

REMARKS & PHOTOS

LONGITUDINAL CRACKING - TRAN. CRACKING -
NG EVIDENT —
There ARE NUMEROUS CRACKS IN The
ARCH MOST ARE (FINE CRKS)
RACK NEAR CENTER OF ARCH EAST SIDE, 50 FROM DOWNSTREAM.
TARTED at SPRINGLINE and PROPAGATED
DINALLY ~~ALONG~~ to The CROWN. The CRACK'S
E .5' UP FROM SPRING LINE.
spalling OF BRICK WORK (MAY be Due to
ving) VERY EVIDENT WEST SIDE and @ SOUTH
line AREA.
Pointing Replacement OF BRICKS VERY EVIDENT
SIDE and SOUTH AREA @ RING Stones —
DIFFERENTIAL SETTLEMENT @ JOINT OF
/W MESURMENT at CAP 2"
/E Corner only -

n DAMGE
/E W/W CAP is MOVED OUTWARD. 4" to 5"

BRIDGE RATING

PREPARED FOR THE
COMMONWEALTH OF MASSACHUSETTS
METROPOLITAN DISTRICT COMMISSION

BOSTON, MASSACHUSETTS
BOYLSTON STREET OVER MUDDY RIVER
B-16-188
MDC-896-098-100

MDC BRIDGE NO. 98

EDWARD M.
MALNATI
STRUCTURAL
No. 33714

Edward M. Malnati

DATE OF INSPECTION: NOVEMBER 16, 1987

DATE OF RATING: AUGUST 2, 1988

BARNES AND JARNIS, INC.

216 TREMONT STREET

BOSTON, MASSACHUSETTS 02116

INDEX

Page

OF BRIDGE RATING 1

N MAP 2

TION OF BRIDGE 3

ANALYSIS ASSUMPTIONS AND CRITERIA 4

ION OF RATING AND RECOMMENDATIONS 5

LE PLANS 6

OADINGS USED FOR BRIDGE RATING 7

CES:

pendix A - Inspection Reports
pendix B - Photographs

BRIDGE EVALUATION RATING AND RECOMMENDED POSTING

Y	LOCATION	BRIDGE NO.	MAINTENANCE NO.
	Boylston Street over Muddy River	B-16-188	MDC896098100

TYPE	INVENTORY RATING	OPERATING RATING	RECOMMENDED POSTING *
	20.0	28.0	
	25.0	34.0	
	36.0	49.0	

d posting in tons.

sting required if blank.

ter than Inventory Rating, equal to Load Factor Rating, or based on the

ing considerations, if any.

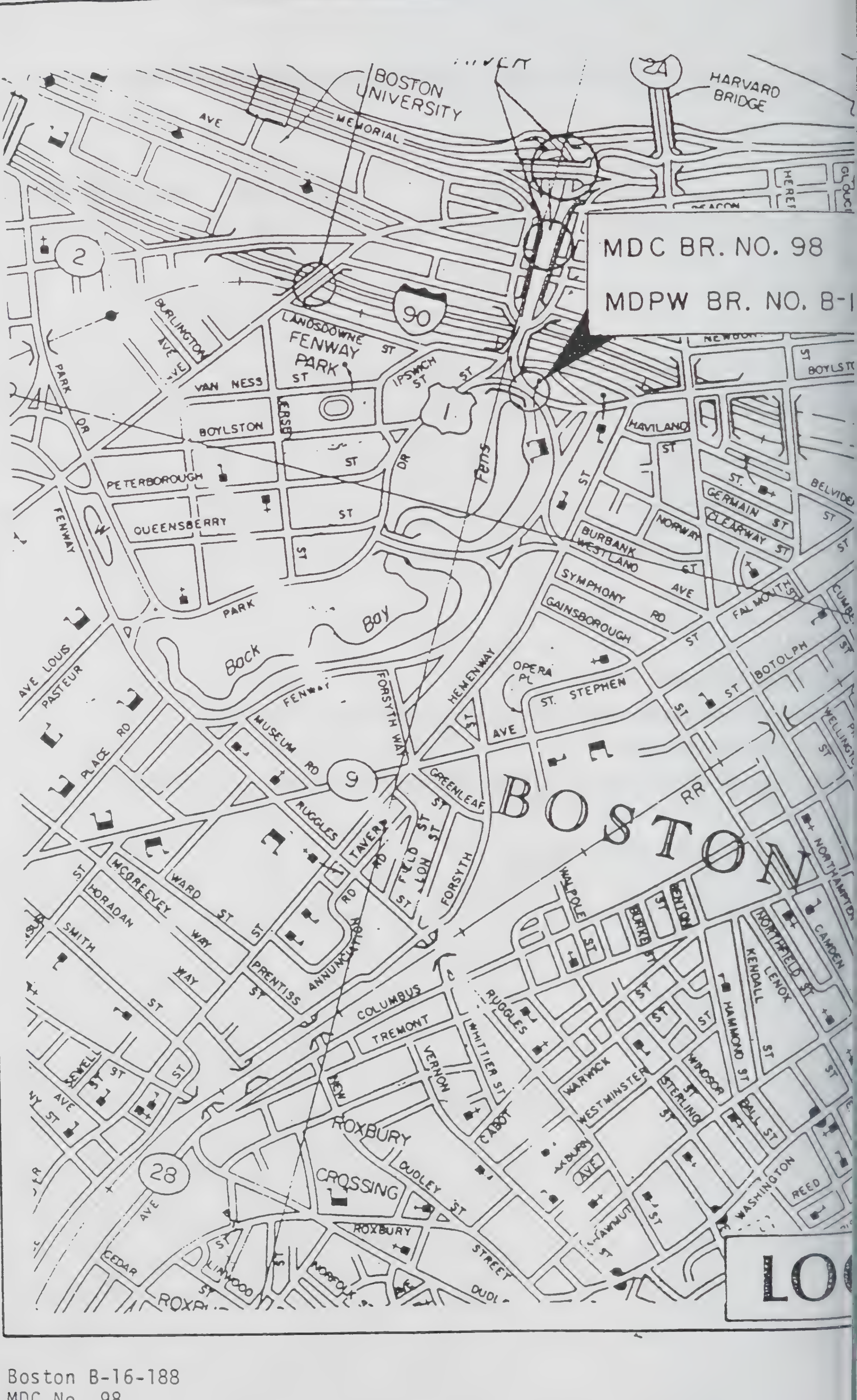
s are based on Engineering Judgement. See "RatingAnalysis Assumptions and

a".

ting Rating = 1.375 X Inventory Rating.

Bridge Engineer

Date



Boston B-16-188
MDC No. 98

DESCRIPTION OF BRIDGE

Boylston Street over Muddy River B-16-188

bridge, built in 1881, is an earth filled brick arch, ries Boylston Street over the Muddy River. The has two 24'-0" paved roadways, separated by a variable sed median. Along the outside of each roadway, is a de concrete sidewalk with a 10'-0" wide grass edge The structure was not posted for load restrictions at of our inspection.

brick arch ring has a square span of 60'-0" at the es and a rise of 22'-0" to the crown. Thickness of the could not be determined. Available plans of the not have details of the arch barrel and the e's brick masonry ring is concealed by fascia es, that match the granite masonry spandrel walls. The ween the spandrel walls, above the arch ring, contains ll, which is overlayed at the roadways with a bituminous wearing surface.

underside of the brick masonry arch is in generally dition. There are areas, near the fascias and nes, with extensive efflorescence staining and spalls in kwork. A crack has formed, that is visible in the brick course of the arch ring. The crack starts at the ringline, and has propagated longitudinally along the

arch barrel bears on cut stone masonry abutments d by timber piles. The substructure appears to be in ndition with no visible signs of movement or settlement.

bridge is potentially an historic landmark. The e, designed by H.H. Richardson, was part of the Boston tem. This was a coordinated system of parks, created by k Law Olmstead, in the late nineteenth century. Known Emerald Necklace" the Boston Park system was a green t linked Boston Common with the Arnold Arboretum and Park. The bridge is now part of the Metropolitan Commission roadway system, in the Fenway section of

RATING ANALYSIS ASSUMPTIONS AND CRITERIA

Boston Boylston Street over Muddy River B

Plans of arch ring for this structure were not avail However based on a review of the plans that were availabl a site inspection by Barnes and Jarnis, Inc. personnel, n reductions in the load capacity of the arch ring appeared have occured.

The bridge is in generally good condition. In accor with MDPW bridge live load rating policy, the Boylston St bridge was rated by engineering judgement, as the structu been carrying normal traffic for many years without any significant signs of distress or section loss.

The substructure was not considered critical for rat purposes.

Boston B-16-188
MDC No. 98

ed on engineering judgement, the inventory ratings are
s, 25.0 tons and 36.0 tons, for the H, Type 3 and 3S2
respectively.

bridge is in generally good condition. The structure
wever, require some remedial work. A crack in the arch
rmed at the springline, and propagated longitudinally,
e soffit. The crack appears to have been caused by
nt that may have occured shortly after construction, and
e repaired by pressure grouting, which will seal the
The presence of effloresence staining, at the masonry
is evidence of moisture in the earth fill. The source of
isture should be discovered and corrected before further
ration occurs. In addition the stone masonry parapets and
s require some repointing, and vegetation should be
from the joints in the concrete sidewalks.

AVAILABLE PLANS

The following plans were made available to Barnes and Jarnis Inc. for their use in determining the live capacity of the bridge.

- City of Boston - Back Bay Park
  Boylston Street Bridge
    Plan of Piling
    Plan showing change in system of Piling & Capping for 1/3 of Bridge Foundations, April, 1881
    Elevation of Frame "F", July, 1881
    Plan and Sections of South East Wing, Feb,
    Half Elevations of Square and Skewed Ends of Arch
    Details of Anchorage for N.W. Wing
    Plan and Sections of Retaining Wall East of Boylston St. Arch Bridge, Jan., 1883

- City of Boston - Back Bay Park
  Boylston St. Bridge
  Plan showing location of Boylston St. Bridge, Sheet No. 1, Aug., 1880
  Plan of Abutments & Foundations, Sheet No. 2, Aug., 1880
  Plan of Pile Foundations, Sheet No. 3, Aug.,

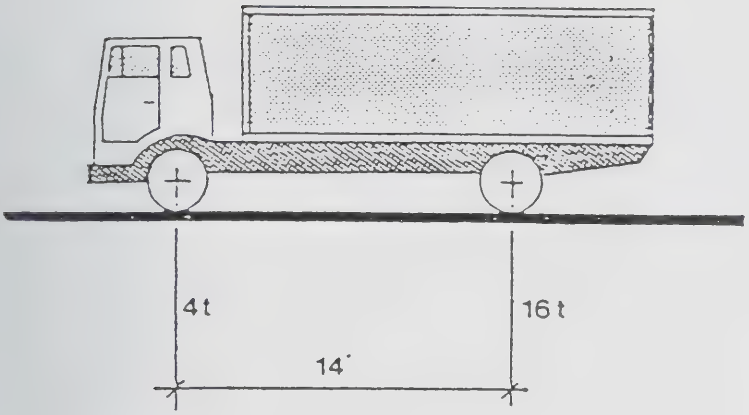
- Boylston Street Bridge
  Long Abutment
  Plan of Courses
  Oct., 1880

- Boylston Street Bridge
  Short Abutment
  Plan of Courses
  Oct., 1880

- City of Boston - Back Bay Park
  Boylston St. Bridge
    Plan of Centering showing position of Frames, Plan No. 1, June, 1881
    Elevations and Sections of Frames marked "A on Plan No. 1, Plan No. 2, July 1881

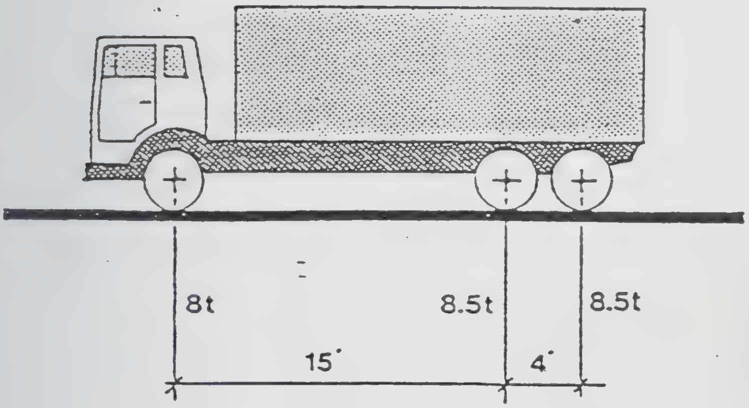
Massachusetts Bridge Ratings

TRUCK LOADINGS



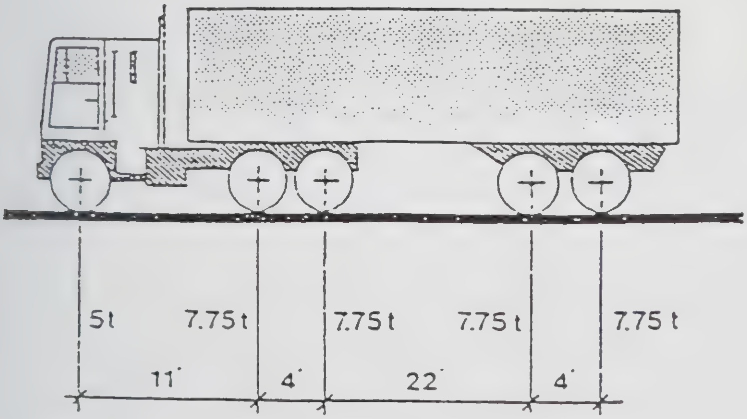
H-20

Total Weight
20 Tons



Type 3

Total Weight
25 Tons



Type 3S2

Total Weight
36 Tons

APPENDIX A - INSPECTION REPORTS

MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

STRUCTURES INSPECTION FIELD REPORT

NDEPTH

STON	DIST. 9	BRIDGE PLAN NO. B-16-188	BRIDGE KEY NO. MDC 896098100

K	STRUCTURE TYPE MASONRY ARCH

STEM BAN	ITEM 07 INVENTORY ROUTE BOYLSTON STREET	ITEM 06 FACILITY UNDER MUDDY RIVER

YEAR REBUILT —	OWNER MDC	INSPECTOR BARNES AND JARVIS, INC. RRS/ EMM/ SMB	DATE INSP. 11/16/87

rface	7
ndition	N
WITE	7
L	7
CONCRETE	6
ONE	6
ARAPETS)	N
	N
tandards	N
	—
s	N
lab	N
ent	7
TEM 58	N
NTROLS	☒
NTROLS	☐

SUPERSTRUCTURE

1. Bearing Devices	N
2. Stringers	N
3. Diaphragms	N
4. ~~Girders or Beams~~ BRICK SOFFIT	6
5. Floor Beams	N
6. Trusses - General	N
- Portals	N
- Bracing	N
7. Rivets or Bolts	N
8. Welds - Cracks	N
9. ~~Concrete~~ MORTAR Cracking	6
10. Collision Damage	7
11. Load Deflection	7
12. Member Alignment	7
13. Load Vibration	7
14. Paint - Epoxy	N
15. Year Painted	N
ITEM 59	6
CONDITION CONTROLS	☒
CAPACITY CONTROLS	☐

SUBSTRUCTURE

1. Abutments -- Wings STONE	7
-- ~~Backwall~~ SPANDRELS	6
-- Brestwall BELOW SPRINGLINE	6
-- Footings	—
-- Piles	—
-- Erosion	7
-- Settlement	6
2. Piers or Bents -- Caps	N
-- Column	N
-- Web	N
-- Footing	N
-- Piles	N
-- Scour	N
-- Settlement	N
3. Pile Bents	N
4. ~~Concrete~~ MORTAR Cracks or Spalls	6
5. Debris on Seats	N
6. Collision Damage	7
7. Adequacy - Hydraulically	7
ITEM 60	6
CONDITION CONTROLS	☒
CAPACITY CONTROLS	☐

TING RATING

	H	3	3S2
(Tons)	—	—	—

66

INVENTORY RATING

	H	3	3S2
(Tons)	—	—	—

DADING

	H	3	3S2
ading (Tons)	—	—	—

	H
ading (Tons)	—

SIGNS

1. Legibility	—
2. Visibility	—
3. Missing (Y-yes; N-no)	
(A) At Bridge	—
(B) Advance	—

RALPH R. SALVUCCI
No. 27150

NOTE: Condition Ratings are to be obtained from appropriate pages from latest copy of the FHWA "Recording & Coding Guide for the Structure Inventory and Appraisal of the Nations Bridges" and the "Massachusetts Coding Guide for Inventory, Inspection, and Appraisal of Bridges".

./84

36 TRAFFIC SAFETY FEATURES

	ITEM 36	CONDITION
1. Bridge Railing STONE PARAPET	0	6
2. Transitions	N	N
3. Approach Guardrail CONT. OF STONE PARAPET	0	6
4. Approach Guardrail Terminal	0	6

CHANNEL & CHANNEL PR

1. Channel Scour
2. Embankment Erosion
3. Fender System
4. Spur Dikes & Jetties
5. Rip Rap
6. Effectiveness
7. Debris
8. Vegetation

ITEM 61

REMARKS — SKETCHES — PHOTOGRAPHS

TRUSS TYPE (Item 43A)

- STRUCTURE IS A SINGLE SPAN STONE ARCH WITH A RED BRICK
- BOYLSTON STREET RUNS NORTH/SOUTH & MUDDY RIVER FLOWS
- PARAPETS AND CAPSTONES NEED MINOR AMOUNTS OF REP
- INTERSECTIONS OF PARAPETS & SIDEWALKS OPEN & VEGETAT
- EXTENSIVE SPALLING AND LEAKAGE THRU ARCH SOFFIT PAR
ON SOUTH SIDE, AND TOWARDS THE EAST & WEST FASCIA/SP
- SPALLING OF ARCH BRICK IS UP TO 2" DEEP.
- SOME BROKEN ARCH STONES ON WEST FASCIA, SOUTH SIDE
- ONE HEAVY CRACK, 1 1/2" WIDE AT WATER LINE (SPRING LINE)
DOWN BETW. BREASTWALL STONES AND UP 2/3 OF WAY T
OF SOFFIT. CRACK STARTS AT NORTH SPRINGLINE. SURFACE
4" DEEP WITH LAYER OF MORTAR BEHIND
- SOME LEAKAGE AND EFFLORESCENCE IN EAST SPANDREL ADJ
TO SOFFIT. EXTENSIVE LEAKAGE AND EFFLORESCENCE IN AREAS
SPALLING AND LEAKAGE IN ARCH SOFFIT.
- VERT. SEPARATION & 1 1/2" DIFFERENTIAL SETTLEMENT AT JOINT IN
- CAPSTONE MOVEMENT NEAR N.E. WINGWALL.

MASSACHUSETTS DEPARTMENT OF PUBLIC WORKS

STRUCTURE INVENTORY AND APPRAISAL

E NO. B-16-188 BRIDGE MNT. NO. MDC896098100 PAGE 1

FICATION CODE | ITEM NO. | CARD CONTROL NUMBER | CARD COL.

assachusetts
istrict 9 (MDC)
Suffolk 4 City/Town Boston
Route 151000000 Principal ☐ Other ☐
ntersected Muddy River
rried by Structure Boylston Street
No. MDC896098100 of
earance Unlimited
0.57 miles
ion No. ——
ridge Letter ——
ilepoint ——
ection Length ——
42° 20.8'
71° 05.5'
ulnerability Brick Arch
tour Length 1 mile
e On Toll Road ☐ On Free Road ☒
Metropolitan District Commission
Metropolitan District Commission

IFICATION

		BY	DATE
ystem F.A. Primary	Transfer of Data		
	Maintenance Inspection		11/16/87
ative MDC	Condition Analysis		8/88
	Appraisal		
Local	Cost Estimate		
50,000+	General Review		

CTURAL DATA

		CODE
1881	43 Structure Type-Main Brick Arch	
Str. 4 Under 0	44 Approach ——	
r. 32000 30 Year 1979	45 No of Spans-Main 1	
ad Unknown CODE	46 Approach ——	
Width w/Sh'ld 69 ft	47 Horizontal Clearance 69.0 ft	
☐ None ☐ Open ☒ Closed	48 Max. Span Length 63 ft.	
15 °	49 Structure Length 70 ft.	
Flared ☒ Yes ☐ No	50 Sidewalk Rt. 20.0 ft. Lt. 20.0 ft.	
)	51 Br. Roadway (curb-curb) 69.0 ft.	
	52 Deck Width (out-out) 99.8 ft.	
Control ☐ Yes ☒ No	53 Vert Clearance over Deck Unlimited ft.	
Vertical —— ft.	54 Under Clearance-Vertical —— ft.	
Horizontal —— ft.	55 Lateral-Right —— ft.	
strictions	56 Left —— ft.	
ce Hwy-Ped./Water CODE	57 Wearing Surface Asphaltic Conc.	

BRIDGE NO. B-16-188 BRIDGE MNT. NO. MDC896098100

CONDITION	MATERIAL	CONDITION ANALYSIS	RATING (9-0)	ITEM NO.	CARD NUM
58 Deck			N		
59 Superstructure			6		
60 Substructure			6		
61 Channel & Channel Protection			6		
62 Culvert & Retaining Walls			N		
63 Estimated Remaining Life	20 years	65 Approach Alignment	4		
64 Operating Rating	549	66 Inventory Rating	536		

APPRAISAL	DEFICIENCIES	RATING (9-0)
67 Structural Condition		6
68 Deck Geometry		6
69 Underclearances-Vert. & Lateral		N
70 Safe Load Capacity		6
71 Waterway Adequacy		7
72 Approach Roadway Alignment		4

PROPOSED IMPROVEMENTS

73 Year Needed Completed Describe (Item 75)

74 Type of Service

75 Type of Work

76 Improvement Length ft.

77 Design Loading CODE

78 Roadway Width ft.

79 Number of Lanes 82 Prop Rdwy Imprv —Year

80 ADT 81 Year 83 —Type

COST OF IMPROVEMENTS

84 $, ,000.

REMARKS

State Information

FHWA Select List= N

AASHTO= 093.4

Identification

MDC896098100

151000000

t District 04

(4) Place code 07000

WATER MUDDY RIVER

HWY BOYLSTON ST

.2 MI W OF MASS AVE

0000.917

Y

ubroute

42 DEG 20 MIN 48.23 SEC

71 DEG 05 MIN 35.40 SEC

Share %

No. #

cture Type and Material

Masonry Code 811

Jointless bridge type: Not applicable

Code 000

unit 001

ns 0000

Not applicable Code N

ective System:

e - Not applicable=no deck Code N

Not applicable=no deck Code N

 - Not applicable=no deck Code N

Age and Service

1881

0000

Highway-Ped

Code 55

04 Under structure 00

027000

997 (109) Truck ADT 06 %

002 KM

Geometric Data

0019.2 M

00019.2 M

Left 01.8 M Right 00.4 M

urb to Curb 021.0 M

030.4 M

h (w/shoulders) 021.0 M

median (no barrier) Code 2

(35) Structure Flared Y

t Clear 99.99 M

riz Clear 21.0 M

e Rdwy 99.99 M

N 00.00 M

f N 00.0 M

00.0 M

Navigation Data

navigation control on waterway Code 0

Code

ance 000.0 M

Vert Clear M

earance 0000.0 M

Classification		Code
(112) NBIS Bridge Length		Y
(104) Highway System		Y
(26) Functional Class -	Urban Arterial	14
(100) Defense Highway		0
(101) Parallel Structure		N
(102) Direction of Traffic -	2-way traffic	2
(103) Temporary Structure		N
(105) Federal Lands Highways		0
(110) Designated National Network		N
(20) Toll -	On free road	3
(21) Maintain -	Other State Agencies	21
(22) Owner -	Other State Agencies	21
(37) Historical Significance	listed	H

Condition	Code
(58) Deck	N
(59) Superstructure	6
(60) Substructure	7
(61) Channel & Channel Protection	7
(62) Culverts	N

Load Rating and Posting		Code
(31) Design Load -	Other/Unknown	0
(63) Operating Rating Method	Allowable Stress (AS)	2
(64) Operating Rating		44.1
(65) Inventory Rating Method -	Allowable Stress (AS)	2
(66) Inventory Rating		32.4
(70) Bridge Posting		5
(41) Structure -	Open	A

Appraisal	Code
(67) Structural Evaluation	6
(68) Deck Geometry	9
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	7
(72) Approach Roadway Alignment	4
(36) Traffic Safety Features	1 0 0 0
(113) Scour Critical Bridges	6

Inspections

(90) Inspection Date 11/17/99 (91) Frequency 24 MO

(92) Critical Feature Inspection:				(93) CFI DATE
(A) Fracture Critical Detail	N	00	MO A)	00/00/00
(B) Underwater Inspection	Y	36	MO B)	12/01/97
(C) Other Special Inspection	N	00	MO C)	00/00/00
(*) Other Inspection	N	00	MO *)	00/00/00
(*) Closed Bridge	N	00	MO *)	00/00/00
(*) Damage Inspection			MO *)	00/00/00

Loads

Date 03/22/2000	H20	Type 3	Type 3S2	Type HS
Operating	28	34	49	49
Inventory	20	25	36	36

Posting

Status LEGAL Date 00/00/00

2 Axle 3 Axle 5 Axle

Misc.

Bridge Name BOYLSTON ST

N Anti-missile fence N Acrow Panel N Jointless Bridge

Accessibility

N	Liftbucket	N	Rigging	Inspection	
N	Ladder	N	Staging	Hours:	12
Y	Boat	N	Traffic Control		
N	Wader	N	RR Flagperson		
N	Inspector 50	N	Police		

STRUCTURES INSPECTION FIELD REPORT
CRITICAL MEMBER INSPECTION

BR. DEPT. NO.
B16401

	8-STRUCTURES NO. TWN 896 392 100	11-KILOM PT 0.322	93b-U/W INSP DATE N 00	93*-CRITICAL MEMBER INSP DATE 06/24/98
-	MEMORIAL NAME/LOCAL NAME	27-YR BUILT 1898	106-YR REBUILT 0000	YR REHAB'D (NON 106)
ED RIVER	26-FUNCTIONAL CLASS. URBAN LOCAL	DIST. BRIDGE INSPECTION ENGINEER Douglas J. Costantino		
	22-OWNER CITY	21-MAINTAINER CITY	TEAM LEADER Thomas S. Prendergast	
T-IN-PLACE	WEATHER HAZY	TEMP[c] 27	TEMP[c]	TEAM MEMBERS F. POLITANO

	H	3	3S2	SINGLE
Actual Posting	6	10	15	
Recommended Posting from Rating Book	6	10	15	

Waived Date: EJDMT Date:

	At bridge N/E	At bridge S/W	Advance N/E	Advance S/W
Signs In Place (Y=Yes N=No)	Y	N	Y	Y
Legibility/ Visibility	7 / 4	- / -	7 / 5	7 / 5

Request for Rating or Rerating (Y/N): N

If YES please give priority: HIGH ( ) MEDIUM ( ) LOW ( )

PLANS: (Y/N): Y

Y **Reason:**

(V.C.R.): (Y/N): N

TAPE#:

ER(S):

R	CRACK (Y/N)	WELD'S CONDITION (0-9)	LOCATION OF DETERIORATION, SECTION LOSS (%), CRACKS, COLLISION DAMAGE, STRESS CONCENTRATION, ETC.	CONDITION PREVIOUS 9	CONDITION PRESENT 9	INV. RATING OF MEMBER FROM RATING ANALYSIS H-20	3	3S2	Deficiencies
	Y	N	SEE ATTACHED NOTES, SKETCH	3	3	N	N	N	S/A
			AND PHOTOS.						
	N	N	SEE ATTACHED NOTES, SKETCH	3	3	9	13	21	S/A
			AND PHOTOS.						

performed:

	I-58	I-59	I-60
(Overall Previous Condition)	3	3	7
(Overall Current Condition)	3	3	7

efect in a structure that requires corrective action.

FICIENCIES:

ncy - (Examples include but are not limited to: Spalled concrete, minor pot holes, minor corrosion to steel, minor scouring, clogged drainage, minor damage to guardrail, etc.)

Deficiency - (Examples include but are not limited to: Large spalls, wide cracks, moderate to major deterioration in concrete, considerable settlement, considerable scouring or undermining, moderate to extensive corrosion to steel, etc.)

ency - A deficiency in a structural component or element of a bridge that poses an extreme hazard or unsafe condition to the public. **(Follow-Up Critical Deficiency Report must be submitted separately)**

::

sible,

ll be prioritized by District Maintenance Engineer or the Responsible Agency (if not a State owned bridge) and repairs be made when funds and/or manpower available].

N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPE
BOSTON	395	B16401	TWN 896 392 100	06/

REMARKS & PHOTOS

WEIGHT POSTING- RECOMMENDED POSTING OF 6T, 10T, 15T FROM 01/9
AT THE WEST SIDE OF THE BRIDGE THERE ARE NO SIGNS. THE FIRST WEST
HAS A 6T, 22T, 35T IMPROPERLY POSTED LIMIT. THE OTHER WEST ADVANC
ACROSS FROM LANSDOWNE ST. NOW FACES NORTH INSTEAD OF WES
BRIDGE SIGN AT THE NORTH EDGE OF THE ROAD IS ALMOST COMPLE
WITH TREE BRANCHES AND SHOULD BE MADE MORE VISIBLE. THERE
BRIDGE SIGN AT THE SOUTH EDGE OF THE ROADWAY ON A LIGHTING ST
CORNER OF CHARLESGATE EAST STREET. THERE IS ONE SIGN WITH 19T, 2
AT THE SOUTH END OF CHARLESGATE EAST ST. IT IS BELIEVED THA
ERRONEOUS.

CLEARANCE POSTING- NOT REQUIRED.

TRAFFIC SAFETY

36-1- The south railing is cast iron posts and wrought iron rails. The north railing is a l
fence. See ITEM58-8.
36-2- There is no transition at the southwest approach. The southeast transition has a w
tied into the granite block endpost. The northwest and northeast transitions are a contin
railing.
36-3- No approach railing exists at the southwest approach. The southeast approach
railing. The northwest and northeast approaches are a continuation of the north railing.
36-4- No guardrail terminals exist.
Standard approach guardrail with proper transitions and end treatments needed at all four

ORIENTATION

According to the 1898 plans the approaches are west and east and the elevations are sou
are twenty-one steel beams (stringers and channels) numbered from south to north
including the sidewalk stringers. The spans and piers are numbered from west to east. Th
south to north.

DECK

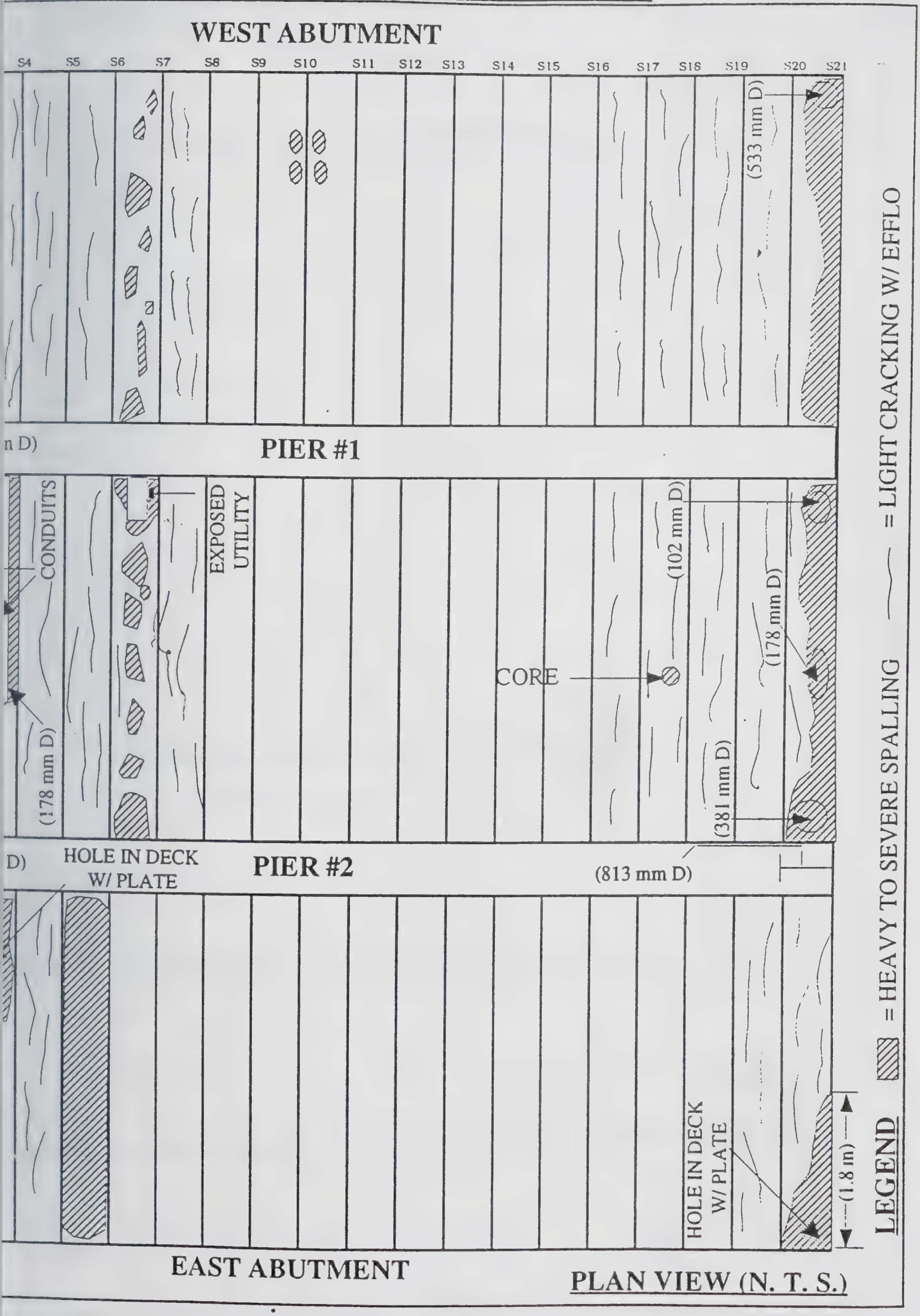
58-2- In span #3 there is a hole through the deck between beam #4 and beam #5 adjacen
steel plate over the hole. There is also a hole through the deck in bay #20 by the dr
abutment. A steel plate has been added over this hole as well. The hole is 600 mm L x 4
heavy spalling of the concrete deck just inside the north fascia beam (#21) in bay #20 in
spalling up to 533 mm D by the drop inlets. There is heavy spalling in bay #6 exposing
#2 and span #3. In span #1 bay #6 there is minor to moderate spalling for the full length
also very heavy spalling in bay #1 in all three spans with spalling up to 203 mm D. T
light longitudinal cracks with light to heavy efflorescence and some stalactites in the f
the last five bays in all three spans. There is also a moderate spall in bay #3 in span #1.
and photos.

SUPERSTRUCTURE

59-1- There is heavy rusting and lamination of the bottom flanges between beam #1
between beam #16 to beam #21. There is heavy rusting of the bottom flanges of the int
section loss assumed around 10%. Original thicknesses of the stringers is unknown and
impossible to obtain section loss. Beam #21 in all three spans has the heaviest rusting a
the outside face of the web and both flanges having section loss. There is heavy lamin
152 mm of the web with assumed section loss up to 75%. See attached sketch and photos

B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION DATE
395	B16401	TWN 896 392 100	06/24/98

REMARKS, SKETCHES, & PHOTOS

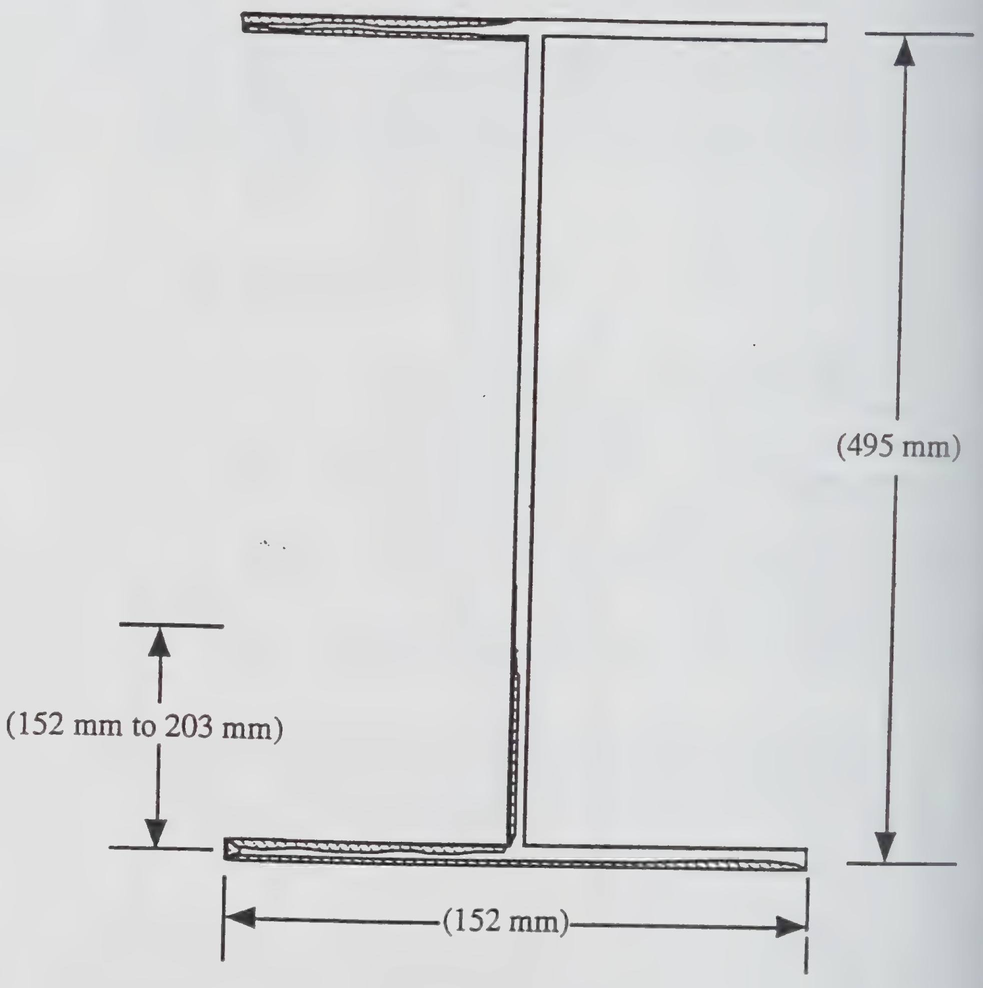


PLAN VIEW (N. T. S.)

PA

OWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INS
OSTON	395	B16401	TWN 896 392 100	0

REMARKS, SKETCHES, & PHOTOS



TYPICAL THRU-SECTION BEAM #21 LOOKING EAST (N

LEGEND

▨ = HEAVY RUSTING AND LAMINATION WITH SECTION LOSS ne 6, 2000

State Information

FHWA Select List= Y

AASHTO= 032.2

Identification

TWN896392100

151000000

rtment District 04

25 (4) Place code 07000

WATER MUDDY RIVER

HWY IPSWICH ST

NEXT TO MASS PIKE

0000.322

ork N

& Subroute

42 DEG 20 MIN 50.03 SEC

71 DEG 05 MIN 35.93 SEC

Code Share %

ure No. #

Structure Type and Material

h: Steel Code 302

Jointless bridge type: Not applicable

r:

Code 000

main unit 003

spans 0000

pe - Concrete Cast-in-Place Code 1

Protective System:

rface - Bituminous Code 6

- None Code 0

ction - None Code 0

Age and Service

1898

d 0000

Highway-Ped

y Code 55

02 Under structure 00

ic 007000

1999 (109) Truck ADT 07 %

th 002 KM

Geometric Data

span 0006.1 M

00019.5 M

Left 01.9 M Right 00.0 M

th Curb to Curb 012.3 M

Out 015.2 M

Width (w/shoulders) 012.5 M

median Code 0

DEG (35) Structure Flared N

Vert Clear 99.99 M

al Horiz Clear 12.3 M

Bridge Rdwy 99.99 M

r ref N 00.00 M

RT ref N 99.9 M

LT 00.0 M

Navigation Data

No navigation control on waterway Code 0

Code

Clearance 000.0 M

Min Vert Clear M

al Clearance 0000.0 M

Classification Code

(112) NBIS Bridge Length Y

(104) Highway System N

(26) Functional Class - Urban Local 19

(100) Defense Highway 0

(101) Parallel Structure N

(102) Direction of Traffic - 2-way traffic 2

(103) Temporary Structure N

(105) Federal Lands Highways 0

(110) Designated National Network N

(20) Toll - On free road 3

(21) Maintain - City/Municipal Highway A 04

(22) Owner - City/Municipal Highway A 04

(37) Historical Significance listed H

Condition Code

(58) Deck 3

(59) Superstructure 3

(60) Substructure 7

(61) Channel & Channel Protection 5

(62) Culverts N

Load Rating and Posting Code

(31) Design Load - Other/Unknown 0

(63) Operating Rating Method Allowable Stress (AS) 2

(64) Operating Rating 10.3

(65) Inventory Rating Method - Allowable Stress (AS) 2

(66) Inventory Rating 14.3

(70) Bridge Posting 0

(41) Structure - Posted for load P

Appraisal Code

(67) Structural Evaluation 2

(68) Deck Geometry 5

(69) Underclearances, vert. and horiz. N

(71) Waterway adequacy 7

(72) Approach Roadway Alignment 8

(36) Traffic Safety Features 0 0 0 0

(113) Scour Critical Bridges D

Inspections

(90) Inspection Date 06/27/99 (91) Frequency 06 MO

(92) Critical Feature Inspection: (93) CFI DATE

(A) Fracture Critical Detail N 00 MO A) 00/00/00

(B) Underwater Inspection Y 36 MO B) 06/10/99

(C) Other Special Inspection Y 06 MO C) 12/17/99

(*) Other Inspection N 00 MO *) 00/00/00

(*) Closed Bridge N 00 MO *) 00/00/00

(*) Damage Inspection MO *) 00/00/00

Loads

Date 00/00/00	H20	Type 3	Type 3S2	Type HS
Operating	06	10	15	12
Inventory	09	13	21	16

Posting

Status POSTED Date 01/31/96

2 Axle 06 3 Axle 10 5 Axle 15

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel N Jointless Bridge

Accessibility

N Liftbucket N Rigging Inspection

N Ladder N Staging Hours: 16

Y Boat N Traffic Control

N Wader N RR Flagperson

N Inspector 50 N Police

MASSACHUSETTS HIGHWAY DEPARTMENT

UNDERWATER OPERATIONS TEAM

DIVERS ACTIVITY REPORT

bridge dept. no.
B-16-176

	5-facility carried COMMONWEALTH AVE. (WB)	6-features intersected MUDDY RIVER	93b-date inspected 12/22/97

tructure no. 896 W12 101	foundation type	dive master R. BONICA

el	access to bridge EMBANKMENT	team members J. FITZGERALD, J. DONAHUE, B. SULLIVAN

ons L, BOULDERS, MUD	water conditions HIGH BACTERIA POLLUTION	depth 1.5 m+/-	visibility 1 m +/-	current NIL

60 (Underwater) **7**

ucture

tments

gs	7
astwall	7
nting	6
tings	IA
s	X
ur	8
lermining	NO
tlement	8
	NA
	NA

s or Bents

n	NA
nting	NA
mn	NA
ting	NA
s	NA
ur	NA
lermining	NA
tlement	NA
	NA

Bents

crete Piles	NA
ber Piles	NA
gonal Bracing	NA
izontal Bracing	NA
teners	NA
	NA

lermining rated as YES or NO

4. Fender System

a.) Piles	NA
b.) Diagonal Bracing	NA
c.) Horizontal Bracing	NA
d.) Wales	NA
e.) Fasteners	NA
f.) Ladders	NA
g.)	NA
h.)	NA

Item 61 (Underwater) **7**

Channel and Channel Protection

1. Debris	7
2. Aggradation	8
3. Utilities	X
4. Rip Rap	7
5.	NA
6.	NA

Item 113 **Scour Critical Bridges**

Scour

a.) Footing Exposed	N
b.) Undermining	N

Scour Countermeasures

a.) Sheeting	N
b.) Rip Rap	Y
c.) Other	N

Y=YES N=NO

Submitted by: R. Bonica

NOWN NA=NOT APPLICABLE IA=INACCESSIBLE

FILE

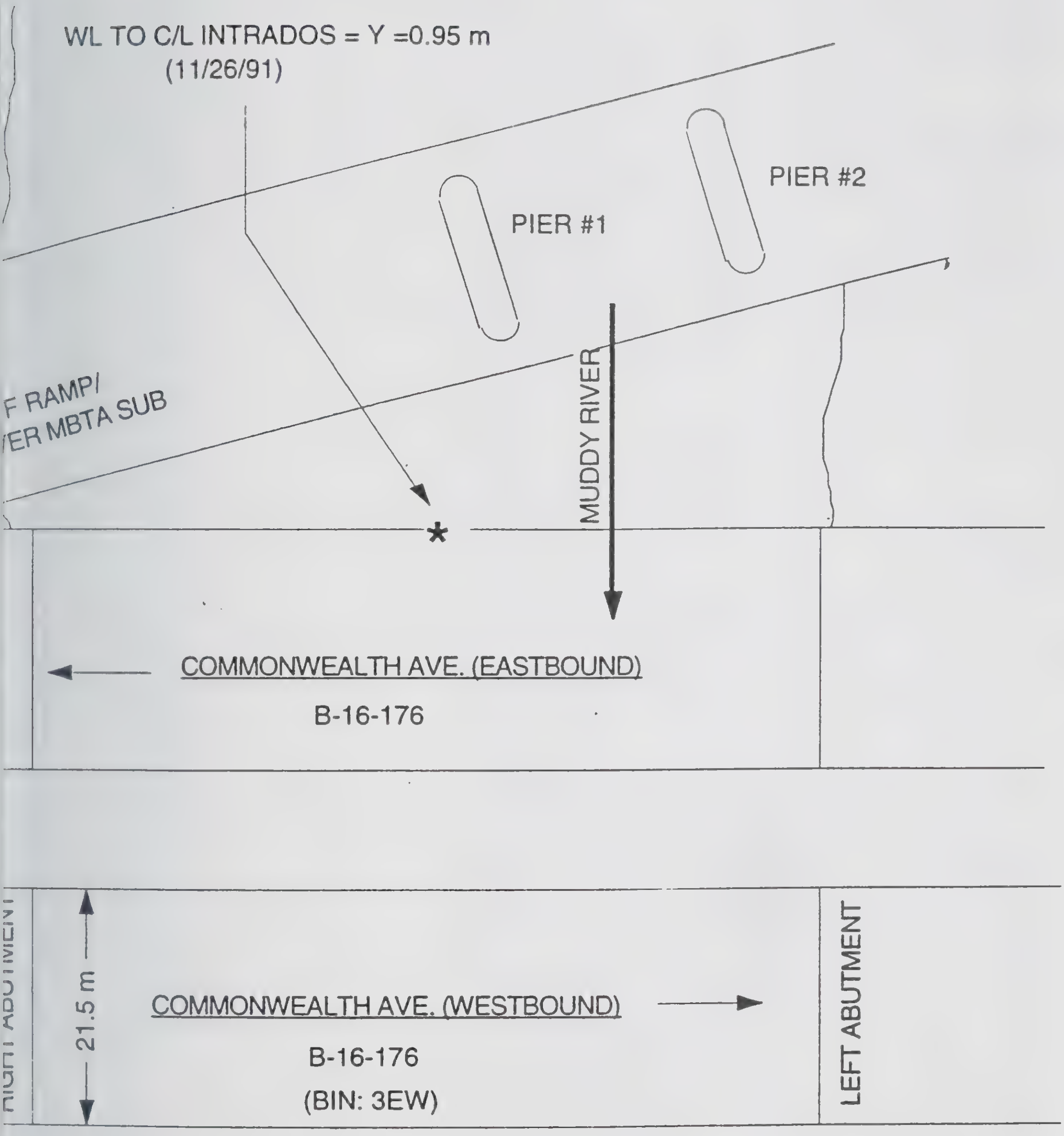
CITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPEC
BOSTON	3EW	B-16-176	431 896 W12 101	Dece

REMARKS & PHOTOS

Single span structure with granite block abutments and concrete bridge seats.
There is minor abrasion at the waterline (0.5 m H) and at interface of granite blocks a abutments.

Left Abutment:
No footing exposed, no undermining.
Maximum penetration between granite blocks is 0.5 m.
There is minor concrete deterioration at the waterline, 0.7 m from the upstream end. (0.4 0.03 m P)

Right Abutment:
No footing exposed, no undermining.
Joints between granite blocks are generally tight, maximum penetration is 0.4 m.



PLAN VIEW
(NTS)

REMENTS ARE IN METRIC.

SCOUR MONITORING CHART
UPSTREAM END

	11/26/91	12/10/94	12/22/97
LEFT ABUTMENT	0.5 m	0.5 m	0.4 m
C/L SPAN	1.9 m	1.9 m	1.9 m
RIGHT ABUTMENT	0.3 m	0.4 m	0.6 m
Y	0.95 m	1.01 m	1.1 m
CORRECTION FACTOR	- - -	+0.06 m	+0.15 m

NOTES:

1. *ALL MEASUREMENTS ARE IN METRIC.*
2. *WATERLINE TO C/L INTRADOS , UPSTREAM END, EASTBOUND BRIDGE =*
(11/26/91)

remely high’

mental group that commissioned the tests.

“Even one drop of water as contaminated as this is dangerous to people with low immune systems, children or HIV-positive people,” said Irene Gillis, chairwoman of Restore Olmsted’s Waterway. Speaking at a conference on the Muddy River held at Harvard’s School of Public Health yesterday, she and other activists warned residents not to swim in the water, eat fish caught there or even touch the water.

MUDDY, Page B4

11/17/96

show high pollution

■ MUDDY
Continued from Page B1

“Even if your dog runs through this water and you pet him, he can bring waterborne disease into your home,” Gillis said.

Restore Olmsted’s Waterway is a citizens’ group dedicated to cleaning up the Muddy River, the 3½-mile waterway that snakes through the Emerald Necklace of parks and green space designed 100 years ago by Frederick Law Olmsted.

The group’s decade-long fight over the Muddy took on renewed importance in the last few weeks when the reed-choked and sewage-contaminated river flooded into residential basements and subway stations. The river has flooded twice in the last two months and polluted water from the Muddy flows into the Charles River.

Former Gov. Michael S. Dukakis, in an interview at the conference, faulted his successor in the State House for not taking leadership in stopping pollution of a riverway that passes close to the homes of thousands of Boston and Brookline residents.

“This is a state responsibility, and you know who should be here? The guy in the governor’s office. It’s one thing to say you care about the environment, and it’s another to put your money where your mouth is,” Dukakis said of Gov. William F. Weld.

“If he had taken a dive in [the Muddy River] at Charlesgate, he’d never have come up,” Dukakis said in a mocking reference to Weld’s much-hyped splash into the Charles River after signing a rivers protection bill.

But Weld’s spokesman, Bob Bliss, expressed disbelief that Dukakis would wag a finger at Weld.

“I’m surprised that Gov. Dukakis, who was a few days late and a couple of hundred million dollars short in cleaning up Boston Harbor, would be criticizing anyone on an environmental cleanup,” Bliss said.

Rick Lombardi, a spokesman for the state Executive Office of Environmental Affairs, insisted that Weld “has taken the initiative” to clean up the river. “We have appointed a mediator to work with a multitude of groups, the city of Boston, Massachusetts Water Resources Authority and the Army Corps of Engineers to try to bring a plan into action,” he said.

Samples taken last month from sediment at the base of the Netherlands Road bridge in Brookline, near the town’s water and sewer works, found 63,000 colonies per gram of clostridium perfringens bacteria, which can cause gas gangrene and gastrointestinal disorders, according to Fred Youngs, director of the Citizens’ Environmental Laboratory in Cambridge. That is 21 times higher than the levels recorded at sewage outfalls in the harbor, he said.

The clostridium signals the presence of other pathogens or disease-bearing organisms such as hepatitis A, staphylococcus and salmonella, Youngs said.

The tests also found elevated levels of the waterborne pathogen enterococcus. In one spot, the bacteria was measured at 5 ½ times the level permitted by Environmental Protection Agency guidelines.

Youngs noted that the levels of fecal coliform – which indicates the presence of raw human sewage in water – measured in the Muddy in a 1992 study by the Army Corps of Engineers was in some cases between 1,000 and 2,500 times higher than EPA guidelines, outstripping the levels in the Charles River that caused alarm a few months ago.

Documents obtained recently indicate that in 1992, when the dangerously elevated levels of fecal coliform were found in the Muddy River, federal officials rejected as too costly plans to improve flood control along the river.

But damage and cleanup costs for the MBTA from last month’s flooding – which forced the closing of the Kenmore Square station for several days and disrupted service for 200,000 riders – is expected to run between $15 and $20 million, calling into question the Army Corps of Engineers’ recommendation rejecting flood control four years ago.

Cathleen Douglas Stone, environmental services director for the city of Boston, said Mayor Thomas M. Menino has a commitment to preserving open space in the city, and is studying ways to limit pollution of the Muddy, from reducing or eliminating discharge into the river to keeping Boston streets cleaner so garbage won’t blow into the river.

Dr. Alan Balsam, director of Brookline’s Public Health Department, warned that people should be cautious about recreational activity near the Muddy.

But Balsam added that Brookline aims within the next year and a half to fix all 39 improper sewer hookups or discharges that are polluting the Muddy with sewage.

PAGE 5 of 5

MASSACHUSETTS HIGHWAY DEPARTMENT
STRUCTURES INSPECTION FIELD REPORT
ROUTINE ARCH INSPECTION

PAGE 1 OF 8
BR. DEPT. NO. B16-193

	8-STRUCTURES NO. TWN 896 193 100	11-MILE POINT 000.010	41-STATUS OPEN	90-ROUTINE INSP DATE 0497
-kards Rd.	MEMORIAL NAME/LOCAL NAME N	27-YR BUILT 1892	106-YR REBUILT 0000	YR REHAB'D (NON 106 X

dy River	26-FUNCTIONAL CLASS. Urban Local		DIST. BRIDGE INSPECTION ENGINEER	CONSULTANT'S STAMP:
rch - Deck	22-OWNER City/mun.	21-MAINTAINER City/mun.	TEAM LEADER Francis P. Collins	
	WEATHER Cloudy, Cool.	TEMP[a] 50°F / TEMP[c] N	TEAM MEMBERS E. Ray	

		DEF
	N	
	5	m/p
	N	
	7	m/p
	7	
	N	
	7	m/p
	6	m/p
	N	
	N	
	N	
	N	
	N	
	N	

NE	SW
8"	8"

		DEF
	5	m/p
	6	m/p
	7	

(Y/N) N

		DEF
	N	
	N	
	N	

ITEM 59 6

SUPERSTRUCTURE

		DEF
1. Arch/Arch Ring	6	m/p
2. Keystone Area	7	
3. Stringers/Tee Beams	N	
4. Floor Beams	N	
5. Spandrel Walls	7	
6. Spring Lines	H	
7. Diaphragms	N	
8. Conn Plt's, Gussets& Angles	N	
9. Hangers	N	
10. Masonry Joints	5	m/p
11. Rivets & Bolts	N	
12. Welds	N	
13. Deformation/Flattening	7	
14. Member Alignment	8	
15. Paint/Coating	N	
16.		
Year Painted:	N	

COLLISION DAMAGE: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

LOAD DEFLECTION: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

LOAD VIBRATION: Please explain
None (✓) Minor ( ) Moderate ( ) Severe ( )

Any Fracture Critical Member? (Y/N) N

Any Cracks? (Y/N) N If YES please explain

ITEM 60 7

SUBSTRUCTURE

			DEF
1. Abutments		7	▨
a. Wingwalls	7		
b. Backwalls	N		
c. Breastwalls	H		
d. Bridge Seats	H		
e. Pedestals	N		
f. Footings	H		
g. Piles	H		
2. Piers or Bents		N	▨
a. Caps	N		
b. Pedestals	N		
c. Columns	N		
d. Webs	N		
e. Footings	N		
f. Piles	N		
3. Pile Bents		N	▨
a. Piles	N		
b. Diagonal Bracing	N		
c. Horizontal Bracing	N		
d. Fasteners	N		
4. Settlement		8	
5. Pointing		6	m/p
6. Erosion		7	
7. Debris on Seats		N	
8. Slope Paving		N	
9.			
10.			

COLLISION DAMAGE: Please explain
None (✓) Minor ( ) Moderate ( ) Severe (

UNDERMINING (Y/N) : If YES please explain N

SCOUR: Please explain
None (✓) Minor ( ) Moderate ( ) Severe (

ITEM 60 FROM U/W INSP. N
Non-Dive

93b-U/W INSP DATE: Nov 10/

N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

ITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	90- IN
Boston (A)	392	B16-193	Twn 896 193 100	0

ITEM 61: CHANNEL & CHANNEL PROTECTION 7

		DEF
1. Channel Scour	7	
2. Embankment Erosion	6	m/P
3. Debris	7	
4. Vegetation	7	
5. Utilities	N	
6. Hydraulic Adequacy	8	
7. Spur Dikes & Jetties	N	
8. Rip Rap & Slope Protection	7	
9. Fender System	N	
10. Effectiveness/Alignment	8	

STREAM FLOW VELOCITY:
Tidal ( ) High ( ) Moderate ( ) Low (✓)

TEM 61 FROM U/W INSP. N

3b-U/W INSP. DATE N 00 10/88

ITEM 36: TRAFFIC SAFETY

	36	COND	DEF
1. Bridge Railing	N		
2. Transitions	N		
3. Approach Guardrail	N		
4. Approach Guardrail Ends	N		

WEIGHT POSTING: *Not Applicable* N

	H	3	3S2	SINGLE
Actual Posting	—	—	—	—
Recommended Posting from Rating Book	—	—	—	—

Waived Date: ☐ EJDMT Date: 07/05/1988

	At bridge N/E	At bridge S/W	Advance N/E	Advance S/W
Signs In Place (Y=Yes N=No)	—	—	—	—
Legibility/ Visibility	—/—	—/—	—/—	—/—

CLEARANCE POSTING: *Not Applicable* N/E

	ft	in
Actual Field Measurement	—	—
Posted Clearance	—	—

	At bridge N/E	At bridge S/W	Advance N/E	Advance S/W
Signs In Place (Y=Yes N=No)	NR	NR	NR	NR
Legibility/ Visibility	—/—	—/—	—/—	—/—

ACCES

Lift Buc
Ladder
Boat
Wader
Inspecto
Rigging
Staging
Traffic C
U/W Insp
RR Flagm
Police
Other:

TOTAL

PLANS:

(V.C.R.)

TAPE #:

List of Fiel

ATING:

Rating Report (Y/N): Y

Date: June 1988

Request for Rating or Rerating (Y/N): N

If YES please give priority:
HIGH ( ) MEDIUM ( ) LOW ( )

Reason: ____________________

CONDITION RATING GUIDE

(For Items 58. 59. 60 and 61)

	CODE	CONDITION	DEFECTS
	N	NOT APPLICABLE	
G	9	EXCELLENT	Excellent condition.
G	8	VERY GOOD	No problem noted.
G	7	GOOD	Some minor problems.
F	6	SATISFACTORY	Structural elements show some minor deterioration.
F	5	FAIR	All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
P	4	POOR	Advance section loss, deterioration, spalling or scour.
P	3	SERIOUS	Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures in steel or shear cracks in concrete may be present.
C	2	CRITICAL	Advance deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may b removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective act
C	1	"IMMINENT" FAILURE	Major deterioration or section loss present in critical structural components or obvious vertical or horizontal moveme Bridge is closed to traffic but corrective action may put it back in light service.
	0	FAILED	Out of service - beyond corrective action.

DEFICIENCY REPORTING GUIDE:

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency -(Examples include but are not limited to: Spalled concrete, minor pot holes, minor corrosion to steel, minor scouring, clogge guardrail, etc.)

S= Severe/Major Deficiency - (Examples include but are not limited to: Large spalls, wide cracks, moderate to major deterioration in concrete considerable scouring or undermining, moderate to extensive corrosion to steel, etc.)

C= Critical Deficiency - A deficiency in a structural component or element of a bridge that poses an extreme hazard or unsafe conc (Follow-Up Critical Deficiency Report must be submitted separately)

URGENCY OF REPAIR:

I= Immediate, (Inspector(s) stay at the bridge until District Maintenance crew or the responsible Agency crew (if not a State bridge) show up and correctiv

A= As soon as possible, (Action will be taken by District Maintenance Engineer or the Responsible Agency (if not a State owned bridge) upon receipt

P= Prioritize, (Shall be prioritized by District Maintenance Engineer or the Responsible Agency (if not a State owned bridge) and repairs be made w available)

B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION DATE
392	B16-193	TWN 896 193 100	04 97

REMARKS, PHOTOS & SKETCHES

6 : Traffic Safety Features

one / Masonry Parapet acts as Bridge railing.

58 Deck

-1 (Wearing Surface) Moderate map Cracking throughout the bituminous. West end has previously patched area approx. 2'x2' with minor settlement. (See photo on pg. 6)

-3 (Spandrel Fill / Settlement) Westerly end - see note on 58-1. (See photo on pg. 6)

-6. (Sidewalks) North Sidewalk has transverse Cracks in the Concrete. Minor. 6 Cracks full width.

-7 (Parapet) Minor roots and Vegetation growing at masonry parapet walls on both the interiors and exteriors.

(IV)

ITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPE
Boston	392	B16-193	TWN 896 193 100	04

REMARKS, PHOTOS & SKETCHES

(Approaches)

a.) minor cracking on the bituminous surface.

b.) Northeast end there was large pool of water in gutter line. City should repa there is a pothole here.

c.) None

Item 59 Superstructure

59-1 (Arch / Arch Ring)

At the north and South of the barrel where the stone meets the bricks the areas of disintergrated bricks heavy efflo. Also cracking. (See photo for typical con on pg. 6

59-10 (Masonry Joints) All mason throughout need re-mortaring.

B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION DATE
392	B16-193	TWN 896 193 100	04 97

REMARKS, PHOTOS & SKETCHES

60 Substructure

0.5 (Painting) Some minor repainting needed at the wing areas.

(4)

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSP
Boston	392	B16-193	TWN 896 193 100	04

REMARKS, PHOTOS & SKETCHES

B16-193 (392)

Southerly end of barrel showing typical condition of both ends of arch. Several bricks cracked or disintegrated with moderate to heavy efflo. where masonry blocks and bricks abutt.

B16-193 (392)

West end showing pat
in bituminous and
settling in spandrel

.997 (A)

Pg. 7 of 8

```
ormation *****************          ********** Classification *************** Code
                              (112) NBIS Bridge Length                               Y
                              (104) Highway System - Off or STP                      0
                               (26) Functional Class - Urban Local                  19
           AASHTO=072.9       (100) Defense Highway                                  0
ation ********************    (101) Parallel Structure                               N
           TWN896193100       (102) Direction of Traffic                             2
              151000000       (103) Temporary Structure
ment District        04       (110) Designated National Network                      0
   (4) Place code     07000    (20) Toll                                             3
  WATER MUDDY RIVER            (21) Maintain - City/Municipal                       04
  HWY   NTHRLNDS RD            (22) Owner - City/Municipal                          04
  BROOKLINE LINE               (37) Historical Significance                          H
                000.010             ********** Condition ******************** Code
 (17) Longitude 071 D 06.7     (58) Deck                                             N
Code           Share    %      (59) Superstructure                                   6
ure No.    #                   (60) Substructure                                     7
 Type and Material ********    (61) Channel & Channel Protection                     7
 Masonry                       (62) Culverts                                         N
                 Code 811           ********** Load Rating and Posting ******* Code
 Other                         (31) Design Load - Other/Unknown                      0
                 Code 000      (64) Operating Rating - Type 3S2                    549
ain unit              001      (66) Inventory Rating - Type 3S2                    536
pans                 0000      (70) Bridge Posting                                   5
                 Code   N      (41) Structure - Open                                 A
otective System:                    ********** Appraisal ******************** Code
ace              Code   6      (67) Structural Evaluation                            6
                 Code   N      (68) Deck Geometry                                    3
ion              Code   N      (69) Underclearances, vert. and horiz.                N
ervice *******************     (71) Waterway adequacy                                8
                     1892      (72) Approach Roadway Alignment                       5
                     0000      (36) Traffic Safety Features                       0NNN
- HWY-Ped                     (113) Scour Critical Bridges                           6
                 Code  55           ********** Inspections ***********************
  02   Under Structure  00     (90) Inspection Date ~~0495~~ _  (91) Frequency  24 MO
c                  004500      (92) Critical Feature Inspection:     (93) CFI DATE
 (109) Truck ADT     01 %       (A) Fracture Critical Detail - N -      MO A)
h                    01 MI      (B) Underwater Inspection    - N -      MO B) 1088
 Data ********************      (C) Other Special Inspection - N -      MO C)
an                 0044 FT      (*) Critical Member          - N        MO *)
                 000044 FT      (*) Closed Bridge            - N        MO *)
Left 00.0 FT  Right 15.0 FT     (*) Damage Inspection        - N/A      MO *)
 Curb to Curb      027.0 FT
t                  047.3 FT         ********** Loads ****************************
th (w/shoulders)     027 FT                    H20    Type 3    Type 3S2   Type HS
                   Code 0           Operating  127    434       549
   (35) Structure Flared 0          Inventory  120    425       536
Vert Clear      99 FT 99 IN         ********** Posting ***************************
l Horiz Clear      27.0 FT          Status EJDMT                     Date 07/05/1988
Bridge Rdwy     99 FT 99 IN         2 Axle             3 Axle              5 Axle
ref          N  00 FT 00 IN         ********** Bridge Specifics ******************
T ref        N     99.9 FT          Bridge Name
T                  00.0 FT          Anti-missile fence                Acrow panel N
n Data *******************          ********** Accessibility *********************
                   Code 0           Liftbucket    N   Rigging         N   Inspection
                   Code             Ladder        N   Staging         N   Hours:  ~~00~~
Clearance          000 FT           Boat          Y   Traffic Control N
 Min Vert Clear        FT           Wader         N   RR Flagman      N
l Clearance       0000 FT           Inspector 50  N   Police          N
```

```
Report date: 05/22/1997 (A)

********** State Information *****************
FHWA Select List=Y
BDEPT#=B16193
Town=Boston
B.I.N.=392                               AASHTO=072.9
********** Identification ********************
(8) Structure Number                    TWN896193100
(5) Inventory Route                        151000000
(2) State Highway Department District             04
(3) County Code      025     (4) Place code    07000
(6) Features Intersected   WATER MUDDY RIVER
(7) Facility Carried       HWY    NTHRLNDS RD
(9) Location               BROOKLINE LINE
(11) Milepoint                               000.010
(16) Latitude 42 D 20.2   (17) Longitude 071 D 06.7
(98) Border Bridge State Code          Share      %
(99) Border Bridge Structure No.    #
********** Structure Type and Material ********
(43) Structure Type Main: Masonry
       Arch-Deck                            Code 811
(44) Structure Type Appr: Other
       Other                                Code 000
(45) Number of spans in main unit                001
(46) Number of approach spans                   0000
(107) Deck Structure Type                   Code   N
(108) Wearing Surface / Protective System:
  A) Type of wearing surface                Code   6
  B) Type of membrane                       Code   N
  C) Type of deck protection                Code   N
********** Age and Service *******************
(27) Year Built                                 1892
(106) Year Reconstructed                        0000
(42) Type of Service: On - HWY-Ped
       Under - Waterway                      Code 55
(28) Lanes:  On Structure   02   Under Structure  00
(29) Average Daily Traffic                    004500
(30) Year of ADT       97 (109) Truck ADT       01 %
(19) Bypass, detour length                     01 MI
********** Geometric Data ********************
(48) Length of maximum span                  0044 FT
(49) Structure Length                      000044 FT
(50) Curb or sidewalk:   Left 00.0 FT  Right 15.0 FT
(51) Bridge Roadway Width Curb to Curb      027.0 FT
(52) Deck Width Out to Out                  047.3 FT
(32) Approach Roadway Width (w/shoulders)     027 FT
(33) Bridge Median                            Code 0
(34) Skew       00 DEG       (35) Structure Flared 0
(10) Inventory Route MIN Vert Clear      99 FT 99 IN
(47) Inventory Route Total Horiz Clear       27.0 FT
(53) Min Vert Clear Over Bridge Rdwy     99 FT 99 IN
(54) Min Vert Underclear ref           N  00 FT 00 IN
(55) Min Lat Underclear RT ref         N     99.9 FT
(56) Min Lat Underclear LT                   00.0 FT
********** Navigation Data *******************
(38) Navigation Control                       Code 0
111) Pier Protection                          Code
(39) Navigation Vertical Clearance            000 FT
116) Vert-lift Bridge Nav Min Vert Clear          FT
(40) Navigation Horizontal Clearance         0000 FT
```

```
      ********** Classification **************** C
(112) NBIS Bridge Length
(104) Highway System - Off or STP
 (26) Functional Class - Urban Local
(100) Defense Highway
(101) Parallel Structure
(102) Direction of Traffic
(103) Temporary Structure
(110) Designated National Network
 (20) Toll
 (21) Maintain - City/Municipal
 (22) Owner - City/Municipal
 (37) Historical Significance
      ********** Condition ******************** Co
 (58) Deck
 (59) Superstructure
 (60) Substructure
 (61) Channel & Channel Protection
 (62) Culverts
      ********** Load Rating and Posting ******* Co
 (31) Design Load - Other/Unknown
 (64) Operating Rating - Type 3S2                  5
 (66) Inventory Rating - Type 3S2                  5
 (70) Bridge Posting
 (41) Structure - Open
      ********** Appraisal ******************** Coc
 (67) Structural Evaluation
 (68) Deck Geometry
 (69) Underclearances, vert. and horiz.
 (71) Waterway adequacy
 (72) Approach Roadway Alignment
 (36) Traffic Safety Features                    NNN
(113) Scour Critical Bridges
      ********** Inspections *************************
 (90) Inspection Date  0497     (91) Frequency  24 M
 (92) Critical Feature Inspection:      (93) CFI DAT
 (A) Fracture Critical Detail - N -        MO A)
 (B) Underwater Inspection    - N -        MO B) 108
 (C) Other Special Inspection - N -        MO C)
 (*) Critical Member          - N          MO *)
 (*) Closed Bridge            - N          MO *)
 (*) Damage Inspection        - N/A        MO *)

     ********** Loads ******************************
                H20     Type 3    Type 3S2    Type HS
     Operating  127     434       549
     Inventory  120     425       536
     ********** Posting ****************************
     Status EJDMT                         Date 07/05/198
     2 Axle               3 Axle              5 Axle
     ********** Bridge Specifics *******************
     Bridge Name
     Anti-missile fence                   Acrow panel N
     ********** Accessibility **********************
     Liftbucket   N   Rigging          N   Inspection
     Ladder       N   Staging          N   Hours:  12
     Boat         N   Traffic Control  N
     Wader        Y   RR Flagman       N
     Inspector 50 N   Police           N
```

Element Data Collection Form

Month	Day	Year
4		97

e Number B16-193

Town BOSTON

BIN 392

District 4

Key Number TWN 896 193 100

Inspectors	F.COLLINS	E.RAY	M.H.D.
	Leader	*Member*	*Agency/Consultant/Dept. Name*

		Env-	Total	Condition States (Quantity or Percent) *					Q or
	Units	iron.	Quantity	1	2	3	4	5	P *
	EA	3	1	0	100				P
	LF	3	44	0	100				P

tween Quantity and Percent for different Elements.

Report Date: June 6, 2000

State Information

BDEPT#=B16193	FHWA Select List=	N
Town=Boston		
B.I.N=392	AASHTO= 065.6	

Identification

(8) Structure Number		TWN896193100
(5) Inventory Route		151000000
(2) State Highway Department District		04
(3) County Code 025	(4) Place code	07000
(6) Features Intersected	WATER MUDDY RIVER	
(7) Facility Carried	HWY NTHRLNDS RD	
(9) Location	BROOKLINE LINE	
(11) Kilometerpoint		0000.016
(12) Base Highway Network		N
(13) LRS Inventory Route & Subroute		
(16) Latitude		42 DEG 20 MIN 14.32 SEC
(17) Longitude		71 DEG 06 MIN 41.42 SEC
(98) Border Bridge State Code	Share	%
(99) Border Bridge Structure No. #		

Structure Type and Material

(43) Structure Type Main:	Masonry	Code	811
Arch - Deck	Jointless bridge type: Not applicable		
(44) Structure Type Appr:			
Other		Code	000
(45) Number of spans in main unit			001
(46) Number of approach spans			0000
(107) Deck Structure Type -	Not applicable	Code	N
(108) Wearing Surface / Protective System:			
A) Type of wearing surface -	Bituminous	Code	6
B) Type of membrane -	Not applicable=no deck	Code	N
C) Type of deck protection -	Not applicable=no deck	Code	N

Age and Service

(27) Year Built			1892
(106) Year Reconstructed			0000
(42) Type of Service: On -	Highway-Ped		
Under - Waterway		Code	55
(28) Lanes: On Structure	02	Under structure	00
(29) Average Daily Traffic			002800
(30) Year of ADT	1999	(109) Truck ADT	01 %
(19) Bypass, detour length			002 KM

Geometric Data

(48) Length of maximum span			0013.4 M
(49) Structure Length			00013.4 M
(50) Curb or sidewalk:	Left 00.0 M	Right	04.6 M
(51) Bridge Roadway Width Curb to Curb			008.2 M
(52) Deck Width Out to Out			014.4 M
(32) Approach Roadway Width (w/shoulders)			008.2 M
(33) Bridge Median -	No median	Code	0
(34) Skew 00 DEG	(35) Structure Flared		N
(10) Inventory Route MIN Vert Clear			99.99 M
(47) Inventory Route Total Horiz Clear			08.2 M
(53) Min Vert Clear Over Bridge Rdwy			99.99 M
(54) Min Vert Underclear ref	N		00.00 M
(55) Min Lat Underclear RT ref	N		00.0 M
(56) Min Lat Underclear LT			00.0 M

Navigation Data

(38) Navigation Control -	No navigation control on waterway	Code	0
(111) Pier Protection		Code	
(39) Navigation Vertical Clearance			000.0 M
(116) Vert-lift Bridge Nav Min Vert Clear			M
(40) Navigation Horizontal Clearance			0000.0 M

Classification

(112) NBIS Bridge Length	
(104) Highway System	
(26) Functional Class -	Urban Local
(100) Defense Highway	
(101) Parallel Structure	
(102) Direction of Traffic -	2-way traffi
(103) Temporary Structure	
(105) Federal Lands Highways	
(110) Designated National Network	
(20) Toll -	On free road
(21) Maintain -	City/Municipal Highway A
(22) Owner -	City/Municipal Highway A
(37) Historical Significance	listed

Condition

(58) Deck	
(59) Superstructure	
(60) Substructure	
(61) Channel & Channel Protection	
(62) Culverts	

Load Rating and Posting

(31) Design Load -	Other/Unknown
(63) Operating Rating Method	Allowable Stress (AS)
(64) Operating Rating	
(65) Inventory Rating Method -	Allowable Stress (AS)
(66) Inventory Rating	
(70) Bridge Posting	
(41) Structure -	Open

Appraisal

(67) Structural Evaluation	
(68) Deck Geometry	
(69) Underclearances, vert. and horiz.	
(71) Waterway adequacy	
(72) Approach Roadway Alignment	
(36) Traffic Safety Features	
(113) Scour Critical Bridges	

Inspections

(90) Inspection Date	04/25/99		(91) Fr
(92) Critical Feature Inspection:			
(A) Fracture Critical Detail	N	00	M
(B) Underwater Inspection	N	00	M
(C) Other Special Inspection	N	00	M
(*) Other Inspection	N	00	M
(*) Closed Bridge	N	00	M
(*) Damage Inspection			M

Loads

Date 00/00/00	H20	Type 3	Type
Operating	28	34	
Inventory	20	25	

Posting

Status	EJDMNT	Da
2 Axle	3 Axle	

Misc.

Bridge Name

N	Anti-missile fence	N	Acrow Panel

Accessibility

N	Liftbucket	N	Rigging
N	Ladder	N	Staging
Y	Boat	N	Traffic Control
N	Wader	N	RR Flagperson
N	Inspector 50	N	Police

Boston

MASSACHUSETTS HIGHWAY DEPARTMENT

PAGE 1 OF 7

STRUCTURES INSPECTION FIELD REPORT

ROUTINE ARCH INSPECTION

BR. DEPT. NO.
B-16-192

	8-STRUCTURES NO. 444-896-000-100		11-MILE POINT 0000.00C	41-STATUS OPEN	90-ROUTINE INSP DATE 03/09/98
/E.	MEMORIAL NAME/LOCAL NAME		27-YR BUILT 1897	106-YR REBUILT 0000	YR REHAB'D (NON 106)
R	26-FUNCTIONAL CLASS. URB. MINOR ART.		DIST. BRIDGE INSPECTION ENGINEER		
ECK	22-OWNER STATE	21-MAINTAINER STATE	TEAM LEADER		
	WEATHER PT.CLDY.	TEMP[a] 40	TEMP[c]	TEAM MEMBERS J.WELCH	

	DEF
	S/P
I	
	M/P
	S/P
I	
	M/P

S/W 25

	DEF
4	S/P
5	M/P
7	

(Y/N) N

	DEF
N	
N	
N	

ITEM 59 *SUPERSTRUCTURE* 7

		DEF
1. Arch/Arch Ring	7	M/P
2. Keystone Area	7	
3. Stringers/Tee Beams	N	
4. Floor Beams	N	
5. Spandrel Walls	7	
6. Spring Lines	7	
7. Diaphragms	N	
8. Conn Plt's, Gussets & Angles	N	
9. Diaphragms	N	
10. Masonry Joints	7	M/P
11. Rivets & Bolts	N	
12. Welds	N	
13. Deformation/Flattening	8	
14. Member Alignment	8	
15. Paint/ Coating	N	
16.		
Year Painted:	N	

COLLISION DAMAGE: Please explain

None (X) Minor ( ) Moderate ( ) Severe ( )

LOAD DEFLECTION: Please explain

None (X) Minor ( ) Moderate ( ) Severe ( )

LOAD VIBRATION: Please explain

None (X) Minor ( ) Moderate ( ) Severe ( )

Any Fracture Critical Member? (Y/N) N

Any Cracks? (Y/N) N If YES Please explain

ITEM 60 *SUBSTRUCTURE* 7

			DEF
1. Abutments		7	
a. Wingwalls	7		M/P
b. Backwalls	N		
c. Breastwalls	7		
d. Bridge Seats	N		
e. Pedestals	N		
f. Footings	H		
g. Piles	N		
2. Piers or Bents		N	
a. Caps	N		
b. Pedestals	N		
c. Columns	N		
d. Webs	N		
e. Footings	N		
f. Piles	N		
3. Pile Bents		N	
a. Piles	N		
b. Diagonal Bracing	N		
c. Horizontal Bracing	N		
d. Fasteners	N		
4. Settlement		7	
5. Pointing		7	
6. Erosion		7	
7. Debris on Seats		N	
8. Slope Paving		N	
9.			
10.			

COLLISION DAMAGE:

None (X) Minor ( ) Moderate ( ) Severe ( )

UNDERMINING (Y/N) If YES please explain N

SCOUR:

None (X) Minor ( ) Moderate ( ) Severe ( )

ITEM 60 FROM U/W INSP. N

93b-U/W INSP DATE: N-00

N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	90- INSPECTIO
BOSTON	3F2	B-16-192	444-896-000-100	03/

TEM 61 *CHANNEL & CHANNEL PROTECTION* 7

		DEF
1. Channel Scour	7	
2. Embankment Erosion	7	
3. Debris	7	
4. Vegetation	7	
5. Utilities	N	
6 Hydraulic Adequacy	8	
7. Spur Dikes & Jetties	N	
8. Rip Rap & Slope Protection	N	
9. Fender System	N	
10. Effectiveness/Alignment	7	

STREAM FLOW VELOCITY:
Tidal ( ) High ( ) Moderate ( ) Low (X)

ITEM 61 FROM U/W INSP. N

93b-U/W INSP. DATE N-00

ITEM 36 *TRAFFIC SAFETY*

	36	COND	DEF
1. Bridge Railing	0	7	
2. Transitions	0	7	
3. Approach Guardrail	N		
4. Approach Guardrail Ends	N		

WEIGHT POSTING: *Not Applicable* ☒

	H	3	3S2	SINGLE
Actual Posting				
Recommended Posting from Rating Book				

Waived Date: EJDMT Date:

	At bridge N/E	*At bridge* S/W	*Advance* N/E	*Advance* S/W
Signs In Place (Y=Yes N=No)				
Legibility/ Visibility				

CLEARANCE POSTING: *Not Applicable* ☒

	ft	in
Actual Field Measurement		
Posted Clearance		

	At bridge N/E	*At bridge* S/W	*Advance* N/E	*Advance* S/W
Signs In Place (Y=Yes N=No)				
Legibility/ Visibility				

ACCESSIBILI

- Lift Bucket
- Ladder
- boat
- Wader
- Inspector 50
- Rigging
- Staging
- Traffic Control
- U/W Inspection
- RR Flagger
- Police
- Other:

TOTAL HOU

PLANS:

(V.C.R.):

TAPE #:

List of Field Tests

RATING:
Rating Report (Y/N): Y
Date: 01/74

Request for Rating or Rerating (Y/N): N
Reason:

If YES please give priority:
HIGH ( ) MEDIUM ( ) LOW ( )

CONDITION RATING GUIDE

(For Items 58, 59, 60 and 61)

	CODE	*CONDITION*	*DEFECTS*
	N	NOT APPLICABLE	
G	9	EXCELLENT	Excellent condition.
G	8	VERY GOOD	No problem noted.
G	7	GOOD	Some minor problems.
F	6	SATISFACTORY	Structural elements show some minor deterioration.
F	5	FAIR	All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
P	4	POOR	Advance section loss, deterioration, spalling or scour.
P	3	SERIOUS	Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are poss in steel or shear cracks in concrete may be present.
C	2	CRITICAL	Advance deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is take
C	1	"IMMINENT" FAILURE	Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecti Bridge is closed to traffic but corrective action may put it back in light service.
	0	FAILED	Out of service - beyond corrective action.

DEFICIENCY REPORTING GUIDE

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency -(Examples include but are not limited to: Spalled concrete, minor pot holes, minor corrosion to steel, minor scouring, clogged draina guardrail, etc.)

S= Severe/Major Deficiency - (Examples include but are not limited to: Large spalls, wide cracks, moderate to major deterioration in concrete, consider considerable scouring or undermining, moderate to extensive corrosion to steel, etc.)

C= Critical Deficiency - A deficiency in a structural component or element of a bridge that poses an extreme hazard or unsafe condition to (Follow-Up Critical Deficiency Report must be submitted separately)

URGENCY OF REPAIR:

I= Immediate, [Inspector(s) stay at the bridge until District Maintenance crew or the responsible Agency crew (if not a State bridge) show up and corrective action

A= As soon as possible, [Action will be taken by District Maintenance Engineer or the Responsible Agency (if not a State owned bridge) upon receipt of the Ins

P= Prioritize, [Shall be prioritized by District Maintenance Engineer or the Responsible Agency (if not a State owned bridge) and repairs be made when funds available].

PAGE 3 OF 7

B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION DATE
3F2	B-16-192	444-896-000-100	03/09/98

REMARKS & PHOTOS

REQUIRED

Y FEATURES
COPING WITH ASHULAR STONE
NK FENCE AT SOUTHWEST AND NORTHWEST ONLY
EXIST

S POT HOLES PREVIOUSLY PATCHED ENTIRE LENGTH OF STRUCTURE
FROM GUTTERLINE TO 1.8m OUT FROM GUTTERLINE.(see photos #1 &
SHOWS RANDOM CRACKING AT BOTH ENDS OF STRUCTURE AT MIDDLE

25mm REVEAL AT SOUTH SIDEWALK AND 100mm AT NORTH
TLEMENT AND BUNCHED UP BITUMINOUS CONCRETE FROM CONSTANT
IRS ACCOUNT FOR LOW REVEALS.

SE CRACKS AT BOTH SIDEWALKS.

ACH EAST TRAVEL LANE FROM GUTTERLINE OUT 1.8m NUMEROUS
EPATCHED POT HOLES.(see photo #1)
TTLEMENT AT NORTHEAST AND SOUTHEAST.

JRE
H NORTH AND SOUTH EDGES OF ARCH SHOWING MODERATE
E AND SOME STALACTITES,ALONG WITH SOME MINOR VOIDS FROM
R.(see photo #3)

AST WING SEVERAL CRACKED STONES AND EFFLORESCENCE STAINS
Y 11.2m FROM EAST END.

ITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION
BOSTON	3F2	B16-192	444-896-000-100	03-0

REMARKS & PHOTOS

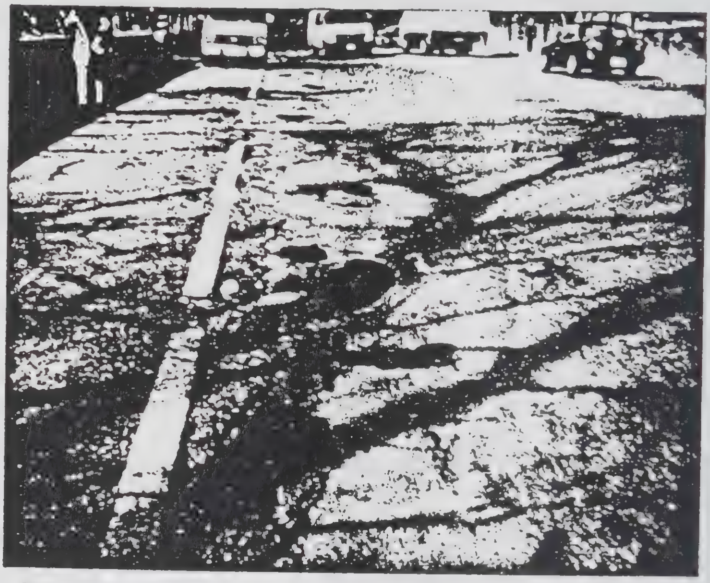


Photo #1

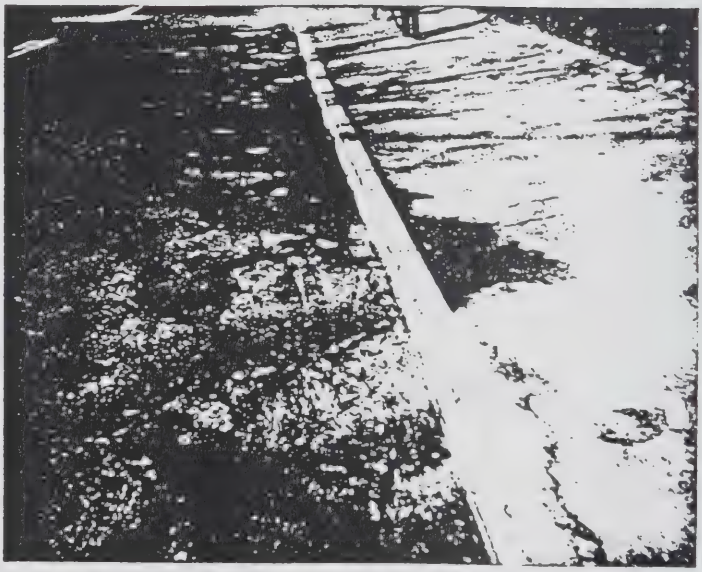


Photo #2

B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION DATE
3F2	B16-192	444-896-000 100	03 09-98

REMARKS & PHOTOS

Photo #3

Report Date: March 13, 1998

State Information

BDEPT#= B16192 FHWA Select List= ☒

Town= Boston

B.I.N= 3F2 AASHTO= 064.7

Identification

(8) Structure Number 444896000100

(5) Inventory Route 181000000

(2) State Highway Department District 04

(3) County Code 025 (4) Place code 07000

(6) Features Intersected WATER MUDDY RIVER

(7) Facility Carried HWY LONGWOOD AVE

(9) Location .5 MI N OF JCT SR9&JWAY

(11) Kilometerpoint 0000.000

(12) Base Highway Network ☐

(13) LRS Inventory Route & Subroute

(16) Latitude 42 DEG 20 MIN 4.51 SEC

(17) Longitude 71 DEG 06 MIN 8.61 SEC

(98) Border Bridge State Code Share %

(99) Border Bridge Structure No. #

Structure Type and Material

(43) Structure Type Main: Masonry Code 811

Arch - Deck

(44) Structure Type Appr:

Other Code 000

(45) Number of spans in main unit 002

(46) Number of approach spans 0000

(107) Deck Structure Type - ~~Concrete Cast-in-place~~ none Code N

(108) Wearing Surface / Protective System:

A) Type of wearing surface - Bituminous Code 6

B) Type of membrane - None Code 0

C) Type of deck protection - None Code 0

Age and Service

(27) Year Built 1897

(106) Year Reconstructed 0000

(42) Type of Service: On - Highway-Ped

Under - Waterway Code 55

(28) Lanes: On Structure 03 Under structure 00

(29) Average Daily Traffic 019000

(30) Year of ADT 1997 (109) Truck ADT 07 %

(19) Bypass, detour length 002 KM

Geometric Data

(48) Length of maximum span 0030.5 M

(49) Structure Length 00050.3 M

(50) Curb or sidewalk: Left 03.0 M Right 03.0 M

(51) Bridge Roadway Width Curb to Curb 010.7 M

(52) Deck Width Out to Out 018.4 M

(32) Approach Roadway Width (w/shoulders) 011.3 M

(33) Bridge Median - No median Code 0

(34) Skew 00 DEG (35) Structure Flared ☐

(10) Inventory Route MIN Vert Clear 99.99 M

(47) Inventory Route Total Horiz Clear 10.7 M

(53) Min Vert Clear Over Bridge Rdwy 99.99 M

(54) Min Vert Underclear ref N 00.00 M

(55) Min Lat Underclear RT ref N 00.0 M

(56) Min Lat Underclear LT 00.0 M

Navigation Data

(38) Navigation Control - No navigation control on waterway Code 0

(111) Pier Protection Code

(39) Navigation Vertical Clearance 000.0 M

(116) Vert-lift Bridge Nav Min Vert Clear M

(40) Navigation Horizontal Clearance 0000.0 M

Classification

(112) NBIS Bridge Length

(104) Highway System

(26) Functional Class - Urban Minor Arteria

(100) Defense Highway

(101) Parallel Structure

(102) Direction of Traffic - 2-way traffi

(103) Temporary Structure

(105) Federal Lands Highways

(110) Designated National Network

(20) Toll - On free road

(21) Maintain - State Highway Agency

(22) Owner - State Highway Agency

(37) Historical Significance listed

Condition

(58) Deck

(59) Superstructure

(60) Substructure

(61) Channel & Channel Protection

(62) Culverts

Load Rating and Posting

(31) Design Load - H 20

(63) Operating Rating Method Allowable Stress (AS)

(64) Operating Rating

(65) Inventory Rating Method - Allowable Stress (AS)

(66) Inventory Rating

(70) Bridge Posting

(41) Structure - Open

Appraisal

(67) Structural Evaluation

(68) Deck Geometry

(69) Underclearances, vert. and horiz.

(71) Waterway adequacy

(72) Approach Roadway Alignment

(36) Traffic Safety Features

(113) Scour Critical Bridges

Inspections

(90) Inspection Date ~~3/11/96~~ 23-09-98 (91) Fr

(92) Critical Feature Inspection:

(A) Fracture Critical Detail ☐ 00 M

(B) Underwater Inspection ☐ 00 M

(C) Other Special Inspection ☐ 00 M

(*) Critical Member ☐ 00 M

(*) Closed Bridge ☐ 00 M

(*) DamageInspection M

Loads

	H20	Type 3	Type
Operating	~~20~~ 75 99	~~23~~ [illegible] 9	
Inventory	~~20~~ 83	~~23~~ 44 99	

Posting

Status LEGAL D

2 Axle 3 Axle

Misc.

Bridge Name

☐ Anti-missile fence ☐ Arrow Panel ☐

Accessibility

☐ Liftbucket ☐ Rigging

☒ Ladder ☐ Staging

☐ Boat ☐ Traffic Control

☐ Wader ☐ RR Flagperson

☐ Inspector 50 ☐ Police

State Information

FHWA Select List: ☒

AASHTO= 075.7

Identification

444896000100

181000000

ent District 04

(4) Place code 07000

WATER MUDDY RIVER

HWY LONGWOOD AVE

.5 MI N OF JCT SR9&JWAY

0000.000

☐

Subroute

42 DEG 20 MIN14.51 SEC

71 DEG 06 MIN18.61 SEC

de Share %

/ No. #

ructure Type and Material

Masonry Code 811

Not applicable

Code 000

iin unit 002

pans 0000

- Not applicable Code N

otective System:

ice - Bituminous Code 6

None Code 0

on - None Code 0

Age and Service

1897

0000

Highway-Ped

Code 55

03 Under structure 00

019000

1997 (109) Truck ADT 07 %

002 KM

Geometric Data

an 0030.5 M

00050.3 M

Left 03.0 M Right 03.0 M

Curb to Curb 010.7 M

018.4 M

idth (w/shoulders) 011.3 M

nedian Code 0

G (35) Structure Flared ☐

ert Clear 99.99 M

Horiz Clear 10.7 M

idge Rdwy 99.99 M

ef N 00.00 M

ref N 00.0 M

00.0 M

Navigation Data

No navigation control on waterway Code 0

Code

earance 000.0 M

Min Vert Clear M

Clearance 0000.0 M

Classification		Code
(112) NBIS Bridge Length		☒
(104) Highway System		☐
(26) Functional Class -	Urban Minor Arterial	16
(100) Defense Highway		1
(101) Parallel Structure		N
(102) Direction of Traffic -	2-way traffic	2
(103) Temporary Structure		☐
(105) Federal Lands Highways		0
(110) Designated National Network		☒
(20) Toll -	On free road	3
(21) Maintain -	State Highway Agency	01
(22) Owner -	State Highway Agency	01
(37) Historical Significance	listed	H

Condition	Code
(58) Deck	N
(59) Superstructure	7
(60) Substructure	7
(61) Channel & Channel Protection	7
(62) Culverts	N

Load Rating and Posting		Code
(31) Design Load -	H 20	4
(63) Operating Rating Method	Allowable Stress (AS)	2
(64) Operating Rating		99.9
(65) Inventory Rating Method -	Allowable Stress (AS)	2
(66) Inventory Rating		99.9
(70) Bridge Posting		5
(41) Structure -	Open	A

Appraisal	Code
(67) Structural Evaluation	7
(68) Deck Geometry	2
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	8
(72) Approach Roadway Alignment	8
(36) Traffic Safety Features	0 0 N N
(113) Scour Critical Bridges	U

Inspections

(90) Inspection Date 3/9/98 (91) Frequency 24 MO

(92) Critical Feature Inspection:				(93) CFI DATE
(A) Fracture Critical Detail	☐	00	MO A)	00/00/00
(B) Underwater Inspection	☐	00	MO B)	10/1/88
(C) Other Special Inspection	☐	00	MO C)	00/00/00
(*) Critical Member	☐	00	MO *)	00/00/00
(*) Closed Bridge	☐	00	MO *)	00/00/00
(*) DamageInspection			MO *)	00/00/00

Loads

	H20	Type 3	Type 3S2	Type HS
Operating	99	99	99	00
Inventory	83	99	99	00

Posting

Status LEGAL Date 1/1/74

2 Axle 3 Axle 5 Axle

Misc.

Bridge Name

☐ Anti-missile fence ☐ Acrow Panel ☐ Integral Bridge

Accessibility

☐ Liftbucket	☐ Rigging	Inspection
☒ Ladder	☐ Staging	Hours: 12
☐ Boat	☐ Traffic Control	
☐ Wader	☐ RR Flagperson	
☐ Inspector 50	☐ Police	

State Information

FHWA Select List= N

AASHTO= 033.7

Identification

BRI896190100

151000000

ent District 04

(4) Place code 07000

WATER MUDDY RIVER

HWY AV LOUIS PST

0000.016

N

Subroute

42 DEG 20 MIN 24.00 SEC

71 DEG 06 MIN 00.00 SEC

de Share %

No. #

ructure Type and Material

Masonry Code 811

Jointless bridge type:

Code 000

ain unit 001

pans 0000

- Code ?

rotective System:

ace - Bituminous Code 6

None Code 0

ion - None Code 0

Age and Service

1850

0000

Highway-Ped

Code 55

01 Under structure 00

009180

1984 (109) Truck ADT 00 %

002 KM

Geometric Data

pan 0004.6 M

00004.6 M

Left 03.8 M Right 05.6 M

Curb to Curb 007.5 M

ut 000.0 M

idth (w/shoulders) 006.1 M

median Code 0

EG (35) Structure Flared N

Vert Clear 99.99 M

Horiz Clear 07.5 M

ridge Rdwy 99.99 M

ref N 00.00 M

T ref N 00.0 M

T 00.0 M

Navigation Data

No navigation control on waterway Code 0

Code

learance 000.0 M

Min Vert Clear M

Clearance 0000.0 M

Classification		Code
(112) NBIS Bridge Length		N
(104) Highway System		N
(26) Functional Class -	Urban Local	19
(100) Defense Highway		0
(101) Parallel Structure		?
(102) Direction of Traffic -		?
(103) Temporary Structure		N
(105) Federal Lands Highways		0
(110) Designated National Network		N
(20) Toll -	On free road	3
(21) Maintain -	Town Agency	03
(22) Owner -	Town Agency	03
(37) Historical Significance	listed	H

Condition	Code
(58) Deck	N
(59) Superstructure	7
(60) Substructure	8
(61) Channel & Channel Protection	7
(62) Culverts	N

Load Rating and Posting		Code
(31) Design Load -	Other/Unknown	0
(63) Operating Rating Method	Allowable Stress (AS)	2
(64) Operating Rating		00.0
(65) Inventory Rating Method -	Allowable Stress (AS)	2
(66) Inventory Rating		00.0
(70) Bridge Posting		0
(41) Structure -	Open	A

Appraisal	Code
(67) Structural Evaluation	3
(68) Deck Geometry	2
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	7
(72) Approach Roadway Alignment	8
(36) Traffic Safety Features	0 0 0 0
(113) Scour Critical Bridges	6

Inspections

(90) Inspection Date 10/01/84 (91) Frequency 24 MO

(92) Critical Feature Inspection:				(93) CFI DATE
(A) Fracture Critical Detail	N	00	MO A)	00/00/00
(B) Underwater Inspection	N	00	MO B)	00/00/00
(C) Other Special Inspection	N	00	MO C)	00/00/00
(*) Other Inspection	N	00	MO *)	00/00/00
(*) Closed Bridge	N	00	MO *)	00/00/00
(*) Damage Inspection			MO *)	00/00/00

Loads

Date 00/00/00	H20	Type 3	Type 3S2	Type HS
Operating	00	00	00	00
Inventory	00	00	00	00

Posting

Status Date 00/00/00

2 Axle 3 Axle 5 Axle

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel N Jointless Bridge

Accessibility

N Liftbucket	N Rigging	Inspection	
N Ladder	N Staging	Hours:	06
N Boat	N Traffic Control		
N Wader	N RR Flagperson		
N Inspector 50	N Police		

Report Date: June 6, 2000

State Information

BDEPT#=B16192

FHWA Select List= Y

Town=Boston

B.I.N=3F2

AASHTO= 064.7

Identification

(8) Structure Number 444896000100

(5) Inventory Route 181000000

(2) State Highway Department District 04

(3) County Code 025 (4) Place code 07000

(6) Features Intersected WATER MUDDY RIVER

(7) Facility Carried HWY LONGWOOD AVE

(9) Location .5 MI N OF JCT SR9&JWAY

(11) Kilometerpoint 0000.000

(12) Base Highway Network N

(13) LRS Inventory Route & Subroute

(16) Latitude 42 DEG 20 MIN 24.51 SEC

(17) Longitude 71 DEG 06 MIN 38.61 SEC

(98) Border Bridge State Code Share %

(99) Border Bridge Structure No. #

Structure Type and Material

(43) Structure Type Main: Masonry Code 811

Arch - Deck Jointless bridge type: Not applicable

(44) Structure Type Appr:

Other Code 000

(45) Number of spans in main unit 002

(46) Number of approach spans 0000

(107) Deck Structure Type - Not applicable Code N

(108) Wearing Surface / Protective System:

A) Type of wearing surface - Bituminous Code 6

B) Type of membrane - None Code 0

C) Type of deck protection - None Code 0

Age and Service

(27) Year Built 1897

(106) Year Reconstructed 0000

(42) Type of Service: On - Highway-Ped

Under - Waterway Code 55

(28) Lanes: On Structure 03 Under structure 00

(29) Average Daily Traffic 023900

(30) Year of ADT 2000 (109) Truck ADT 07 %

(19) Bypass, detour length 002 KM

Geometric Data

(48) Length of maximum span 0030.5 M

(49) Structure Length 00050.3 M

(50) Curb or sidewalk: Left 03.0 M Right 03.0 M

(51) Bridge Roadway Width Curb to Curb 010.7 M

(52) Deck Width Out to Out 018.4 M

(32) Approach Roadway Width (w/shoulders) 011.3 M

(33) Bridge Median - No median Code 0

(34) Skew 00 DEG (35) Structure Flared N

(10) Inventory Route MIN Vert Clear 99.99 M

(47) Inventory Route Total Horiz Clear 10.7 M

(53) Min Vert Clear Over Bridge Rdwy 99.99 M

(54) Min Vert Underclear ref N 00.00 M

(55) Min Lat Underclear RT ref N 00.0 M

(56) Min Lat Underclear LT 00.0 M

Navigation Data

(38) Navigation Control - No navigation control on waterway Code 0

(111) Pier Protection Code

(39) Navigation Vertical Clearance 000.0 M

(116) Vert-lift Bridge Nav Min Vert Clear M

(40) Navigation Horizontal Clearance 0000.0 M

Classification

(112) NBIS Bridge Length

(104) Highway System

(26) Functional Class - Urban Minor Arterial

(100) Defense Highway

(101) Parallel Structure

(102) Direction of Traffic - 2-way traffic

(103) Temporary Structure

(105) Federal Lands Highways

(110) Designated National Network

(20) Toll - On free road

(21) Maintain - State Highway Agency

(22) Owner - State Highway Agency

(37) Historical Significance listed

Condition

(58) Deck

(59) Superstructure

(60) Substructure

(61) Channel & Channel Protection

(62) Culverts

Load Rating and Posting

(31) Design Load - H 20

(63) Operating Rating Method Allowable Stress (AS)

(64) Operating Rating

(65) Inventory Rating Method - Allowable Stress (AS)

(66) Inventory Rating

(70) Bridge Posting

(41) Structure - Open

Appraisal

(67) Structural Evaluation

(68) Deck Geometry

(69) Underclearances, vert. and horiz.

(71) Waterway adequacy

(72) Approach Roadway Alignment

(36) Traffic Safety Features

(113) Scour Critical Bridges

Inspections

(90) Inspection Date 03/09/2000 (91) Freq

(92) Critical Feature Inspection:

(A) Fracture Critical Detail N 00 MC

(B) Underwater Inspection N 00 MC

(C) Other Special Inspection N 00 MC

(*) Other Inspection N 00 MC

(*) Closed Bridge N 00 MC

(*) Damage Inspection MC

Loads

Date 00/00/00	H20	Type 3	Type 3S
Operating	20	23	3
Inventory	20	23	3

Posting

Status WAIVED Date

2 Axle 3 Axle

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel N

Accessibility

N Liftbucket N Rigging

Y Ladder N Staging

N Boat N Traffic Control

N Wader N RR Flagperson

N Inspector 50 N Police

MASSACHUSETTS HIGHWAY DEPARTMENT
UNDERWATER OPERATIONS TEAM
DIVERS ACTIVITY REPORT

PAGE 1 OF 4

BR. DEPT. NO. B-16-189

8-STRUCTURE NO. TWN 896 189 100	LEVEL OF INSP. II		93b- INSPECTION DATE 4/14/00
ACCESS TO BRIDGE EMBANKMENT	UNDERWATER OPERATIONS ENGINEER J. DONAHUE		
DEPTH 2 m	VISIBILITY 0	TEAM LEADER (DIVE MASTER) R. BONICA	*Report submitted by:* R. Bonica
CURRENT NIL	TEAM MEMBERS W. COLLERAN, J. DESMOND		

)	6	DEF
	6	
	N	
	N	
	N	
	7	
	6	
	N	
	6	
	7	
	X	
	8	
	7	
	N	
	6	
	N	
	N	
	N	
s	7	
	6	
	7	
	X	
	8	
	7	
	N	
	N	
	N	
	N	
	N	
	N	
	N	
	N	
s / N=No)	N	

ITEM 61 5

CHANNEL & CHANNEL PROTECTION

			DEF
1. Channel Scour		8	
2. Embankment Erosion		7	
3. Debris		6	M-P
4. Vegetation		7	
5. Utilities		X	
6. Rip-Rap/Slope Protection		N	
7. Aggradation		5	M-P
8. Fender System		N	
a. Piles			
b. Diagonal Bracing			
c. Horizontal Bracing			
d. Wales			
e. Fasteners			
f. Ladders			

ITEM 62 N

CULVERTS

		DEF
1. Roof	N	
2. Floor	N	
3. Walls	N	
4. Headwall	N	
5. Wingwall	N	
6. Pipe	N	
7. Protective Coating	N	
8. Embankment	N	
9. Wearing Surface	N	
10. Railing	N	
11. Sidewalks	N	
12. Utilities	N	
13. Member Alignment	N	
14. Deformation	N	
15. Scour	N	
16. Settlement	N	
	N	
	N	

ITEM 59 *SUPERSTRUCTURE* (If any part done by divers)

		DEF

UNDERMINING (Y=Yes / N=No) N

DEFICIENCY REPORTING GUIDE

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency - Deficiencies which are minor in nature, generally do not impact the structural integrity of the bridge and could easily be repaired. Examples include but are not limited to: Spalled concrete, Minor scouring, etc.

S= Severe/Major Deficiency - Deficiencies which are more extensive in nature and need more planning and effort to repair. Examples include but are not limited to: Moderate to major deterioration in concrete, Exposed and corroding rebars, Deteriorated timber piles, Considerable settlement, Considerable scouring or undermining, etc.

C-S= Critical-Structural Deficiency - A deficiency in a structural element of a bridge that poses an extreme unsafe condition due to the failure or imminent failure of the element which will affect the structural integrity of the bridge.

C-H= Critical-Hazard Deficiency - A deficiency in a component or element of a bridge that poses an extreme hazard or unsafe condition to the public, but does not impair the structural integrity of the bridge. Examples include but are not limited to: Any part of piles or fender system which are projecting outward and may become a safety hazard for the navigational traffic, etc.

URGENCY OF REPAIR:

I= Immediate- Inspector(s) immediately contact District Bridge Engineer to report the Deficiency and to receive further instruction from him/her].

A= As soon as possible- [Action/Repair should be initiated by District Maintenance Engineer or the responsible Party (if not a State owned bridge) upon receipt of the Inspection Report.]

P= Prioritize- [Shall be prioritized by District Maintenance Engineer or the Responsible Party (if not a State owned bridge) and repairs made when funds and/or manpower is available].

N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION
BOSTON	391	B-16-189	TWN 896 189 100	April 14,

REMARKS & PHOTOS

General:
Orientation - Abutments are labeled left and right, looking downstream. Piers are numbere
looking downstream.
Sta 1+00 is at downstream end.
Bridge is a five span arch structure with granite block breastwalls and pierwalls, brick and m
and Roxbury pudding stone fascias.
Brick intrados appears to be in good condition.

ITEM 60:

Left Abutment:
Wings - There is some penetration into the joints of the pudding stone wingwalls.
Pointing - The joint above the granite breastwalls has some penetrations.
Footing / Scour - The granite/stone footing is exposed for a length of 14.6 m, beginning appro
m from the upstream end. Footing toe width is 0.15 m and maximum exposed height is 30 m
footing was found by feel due to the lack of visibility.

Right Abutment:
Wings - Same note as left abutment.
Pointing - Same note as left abutment.

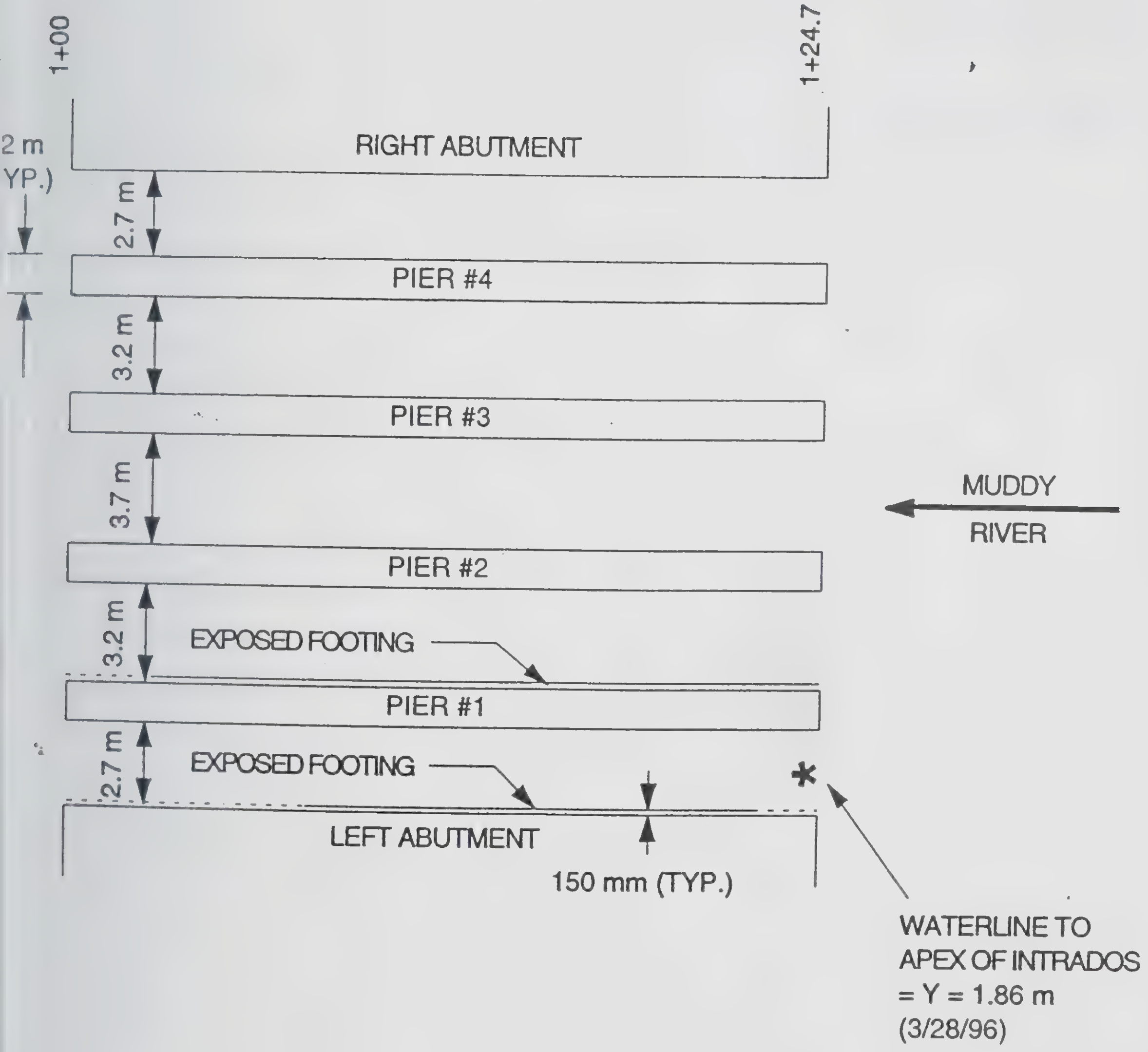
Pier #1:
Pierwall / Pointing - There is full depth penetration through the pier at the downstream end at
of granite block and fascia, at the waterline.
Footing / Scour- The granite/stone footing is exposed along right side for a length of 22
upstream end. Maximum exposed height is 150 mm. Exposed footing was found by feel due
visibility.

Pier #2:
Pierwall / Pointing - There is full depth penetration through the pier at the downstream end at
of granite block and fascia, at the waterline.

ITEM 61:
Scour: See exposed footing note, Left Abutment and Pier #1.

Aggradation: Aggradation has built up at the upstream and downstream ends of each channe
left abutment.

B-16-189 BIN: 391 4/14/00



PLAN VIEW
(NTS)

NS AND MEASUREMENTS ARE IN METRIC.

SCOUR MONITORING CHART
STA 1+24.7 (UPSTREAM END)

	3/28/96	4/14/00
LEFT ABUTMENT	1.8 m	1.8 m
PIER #1 - R. SIDE	2.1 m	2.0 m
PIER #2 - R. SIDE	1.1 m	1.3 m
PIER #3 - R. SIDE	1.2 m	1.7 m
PIER #4 - R. SIDE	DRY	0.2 m
RIGHT ABUTMENT	DRY	0.2 m
Y	1.86 m	1.71 m
CORRECTION FACTOR	---	-0.15 m

NOTES:
1. WATERLINE TO APEX OF INTRADOS, LEFT SPAN = Y = 1.86 m (3/28/96).
2. SOUNDINGS ADJUSTED TO 3/28/96 WATERLINE WITH CORRECTION FACTOR.
3. ALL STATIONS AND MEASUREMENTS ARE IN METRIC.
4. STA 1+00 IS AT DOWNSTREAM END.

Element Data Collection Form

Month	Day	Year
12	22	97

idge Number B-16-176(WB)

Town BOSTON

BIN 3EW

District 4

idge Key Number 431 896 W12 101

Inspectors BONICA — Leader; FITZGERALD, DONAHUE, SULLIVAN — Member; U/W OPNS — Agency/Consultant/Dept. Name

	Units	Env-iron..	Total Quantity	Condition States (Quantity or Percent) * 1	2	3	4	5	Q or P *
IT	M	2	43	43					Q

h between Quantity and Percent for different Elements.

PAGE 1 OF 11

MASSACHUSETTS HIGHWAY DEPARTMENT
STRUCTURES INSPECTION FIELD REPORT
ROUTINE INSPECTION

BR. DEPT. NO.
B-16-176

	8-STRUCTURES NO. 431-896-W12-101	11-KILOM PT 0000.00C	41-STATUS OPEN	90-ROUTINE INSP DATE 03/02/98
EALTH AVE.	MEMORIAL NAME/LOCAL NAME	27-YR BUILT 1917	106-YR REBUILT 1974	YR REHAB'D (NON 106)
D IVER	26-FUNCTIONAL CLASS. URBAN ARTERIAL	DIST. BRIDGE INSPECTION ENGINEER Douglas J. Consentino		
	22-OWNER STATE	21-MAINTAINER STATE	TEAM LEADER John [illegible]	
IN PLACE	WEATHER FAIR	TEMP[a] 40	TEMP[c]	TEAM MEMBERS J.WELCH

		DEF
	8	
	6	M/P
	8	
	N	
	7	
	N	
	7	
	7	M/P
	7	M/P
	N	
	N	
	N	
	7	M/P
	H	

N/E	S/W
152	152

		DEF
	7	
	7	
	7	M/P

(Y/N) N

		DEF
	N	
	N	
	N	

ITEM 59 SUPERSTRUCTURE 7

			DEF
1. Stringers		7	
2. Floorbeams		N	
3. Floor System Bracing		N	
4. Girders or Beams		7	
5. Trusses - General		N	
a. Upper Chords	N		
b. Lower Chords	N		
c. Web Members	N		
d. Lateral Bracings	N		
e. Sway Bracings	N		
f. Portals	N		
g. End Posts	N		
6. Pin & Hangers		N	
7. Conn Plt's, Gussets & Angles		N	
8. Cover Plates		N	
9. Bearing Devices		7	
10. Diaphragms/Cross Frames		7	
11. Rivets & Bolts		7	
12. Welds		7	
13. Member Alignment		8	
14. Paint/ Coating		5	M/P
15.			
Year Painted:		X	

COLLISION DAMAGE: Please explain
None (X) Minor ( ) Moderate ( ) Severe ( )
LOAD DEFLECTION: Please explain
None (X) Minor ( ) Moderate ( ) Severe ( )
LOAD VIBRATION: Please explain
None (X) Minor ( ) Moderate ( ) Severe ( )

Any Fracture Critical Member : (Y/N) N
Any Cracks : (Y/N) N

ITEM 60 SUBSTRUCTURE 7

			DEF
1. Abutments		7	
a. Wingwalls	7		M/P
b. Backwalls	8		
c. Breastwalls	7		
d. Bridge Seats	7		
e. Pedestals	N		
f. Footings	H		
g. Piles	N		
2. Piers or Bents		N	
a. Caps	N		
b. Pedestals	N		
c. Columns	N		
d. Webs	N		
e. Footings	N		
f. Piles	N		
3. Pile Bents		N	
a. Piles	N		
b. Diagonal Bracing	N		
c. Horizontal Bracing	N		
d. Fasteners	N		
4. Settlement		7	
5. Pointing		N	
6. Erosion		7	
7. Debris on Seats		7	
8. Slope Paving		N	
9.			
10.			

COLLISION DAMAGE:
None (X) Minor ( ) Moderate ( ) Severe ( )
UNDERMINING (Y/N) If YES please explain N
SCOUR:
None (X) Minor ( ) Moderate ( ) Severe ( )

ITEM 60 FROM U/W INSP. 7

93b-U/W INSP DATE: 12/22/97

N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	90- INSPE
BOSTON	3EW	B-16-176	431-896-W12-101	(

ITEM 61 *CHANNEL & CHANNEL PROTECTION* 7

		DEF
1. Channel Scour	7	
2. Embankment Erosion	7	
3. Debris	6	M/P
4. Vegetation	7	
5. Utilities	N	
6 Hydraulic Adequacy	7	
7. Spur Dikes & Jetties	N	
8. Rip Rap & Slope Protection	7	
9. Fender System	N	
10. Effectiveness/Alignment	7	

STREAM FLOW VELOCITY:
Tidal ( ) High ( ) Moderate ( ) Low (X)

ITEM 61 FROM U/W INSP. 7

93b-U/W INSP. DATE 12/22/97

ITEM 36 *TRAFFIC SAFETY*

	36	COND	DEF
1. Bridge Railing	1	7	M/P
2. Transitions	N	-	
3. Approach Guardrail	N	-	
4. Approach Guardrail Ends	N	-	

WEIGHT POSTING: *Not Applicable* ☒

	H	3	3S2	SINGLE
Actual Posting				
Recommended Posting from Rating Book				

Waived Date: EJDMT Date:

	At bridge N/E	At bridge S/W	Advance N/E	Advance S/W
Signs In Place (Y=Yes N=No)				
Legibility/ Visibility				

CLEARANCE POSTING: *Not Applicable* ☒

	ft	in
Actual Field Measurement		
Posted Clearance		

	At bridge N/E	At bridge S/W	Advance N/E	Advance S/W
Signs In Place (Y=Yes N=No)				
Legibility/ Visibility				

ACCESSIB
Lift Bucket
Ladder
boat
Wader
Inspector 50
Rigging
Staging
Traffic Contr
U/W Inspectio
RR Flagger
Police
Other:

TOTAL HO

PLANS:

(V.C.R.):
TAPE #:

List of Field Te

RATING:
Rating Report (Y/N): Y
Request for Rating or Rerating (Y/N): N
If YES please give priority: HIGH ( ) MEDIUM ( ) LOW ( )
Date: 10/97
Reason:

CONDITION RATING GUIDE
(For Items 58, 59, 60 and 61)

	CODE	CONDITION	DEFECTS
	N	NOT APPLICABLE	
G	9	EXCELLENT	Excellent condition.
G	8	VERY GOOD	No problem noted.
G	7	GOOD	Some minor problems.
F	6	SATISFACTORY	Structural elements show some minor deterioration.
F	5	FAIR	All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
P	4	POOR	Advance section loss, deterioration, spalling or scour.
P	3	SERIOUS	Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are in steel or shear cracks in concrete may be present.
C	2	CRITICAL	Advance deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be pr removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is
C	1	"IMMINENT" FAILURE	Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement a Bridge is closed to traffic but corrective action may put it back in light service.
	0	FAILED	Out of service - beyond corrective action.

DEFICIENCY REPORTING GUIDE:

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency - (Examples include but are not limited to: Spalled concrete, minor pot holes, minor corrosion to steel, minor scouring, clogged d guardrail, etc.)

S= Severe/Major Deficiency - (Examples include but are not limited to: Large spalls, wide cracks, moderate to major deterioration in concrete, co considerable scouring or undermining, moderate to extensive corrosion to steel, etc.)

C= Critical Deficiency - A deficiency in a structural component or element of a bridge that poses an extreme hazard or unsafe conditio **(Follow-Up Critical Deficiency Report must be submitted separately)**

URGENCY OF REPAIR:

I= Immediate, (Inspector(s) stay at the bridge until District Maintenance crew or the responsible Agency crew (if not a State bridge) show up and corrective ac

A= As soon as possible, (Action will be taken by District Maintenance Engineer or the Responsible Agency (if not a State owned bridge) upon receipt of t

P= Prioritize, (Shall be prioritized by District Maintenance Engineer or the Responsible Agency (if not a State owned bridge) and repairs be made when available).

PAGE 3 OF 11

B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION DATE
3EW	B-16-176	431-896-W12-101	03/02/98

REMARKS & PHOTOS

OT REQUIRED

FETY FEATURES
ETE ENCASED BALUSTRADES AND RAIL (see 58-8)
OT EXIST
OT EXIST
OT EXIST

WIDTH TRANSVERSE CRACKING OVER BOTH ABUTMENTS WITH SOME TCHED VOID AREAS.

PARAPET SHOWS MINOR LIGHT VERTICAL CRACKS.

THWEST CORNER TWO BALUSTRADES MISSING; NORTH RAIL SECOND POST EST MINOR SPALLING.

RUSTING OF WATER UTILITY.

S
TLEMENT AT BOTH SOUTHWEST AND NORTHWEST; NORTHEAST SETTLED 40

TURE

CONDITION OF SUPERSTRUCRURE REMAINS IN GOOD CONDITION WITH LEM NOTED BEING IS THE FLAKING AND PEELING OF PAINT OF THE TURE MEMBERS.

JRE

THEAST CORNER LIGHT VERTICAL CRACK WITH EFFLORESCENCE.

ND CHANNEL PROTECTION
EBRIS BENEATH STRUCTURE AND ALONG EMBANKMENTS.

B)

2- district 4

MASSACHUSETTS HIGHWAY DEPARTMENT

UNDERWATER OPERATIONS TEA

DIVERS ACTIVITY REPORT

4-city/town BOSTON	5-facility carried COMMONWEALTH AVE. (WB)		6-features intersected MUDDY RIVER	
bin no. 3EW	8-structure no. 431 896 W12 101	foundation type		dive master R. BONICA
inspection level II	access to bridge EMBANKMENT		team members J. FITZGERALD, J. DONAHUE, B. SULLIVA	
bottom conditions SILT, GRAVEL, BOULDERS, MUD	water conditions HIGH BACTERIA POLLUTION	depth 1.5 m+/-	visibility 1 m +/-	c N

Item 60 (Underwater) Substructure 7

1. Abutments

a.) Wings	7
b.) Breastwall	7
c.) Pointing	6
d.) Footings	IA
e.) Piles	X
f.) Scour	8
g.) Undermining	NO
h.) Settlement	8
i.)	NA
j.)	NA

2. Piers or Bents

a.) Stem	NA
b.) Pointing	NA
c.) Column	NA
d.) Footing	NA
e.) Piles	NA
f.) Scour	NA
g.) Undermining	NA
h.) Settlement	NA
i.)	NA

3. Pile Bents

a.) Concrete Piles	NA
b.) Timber Piles	NA
c.) Diagonal Bracing	NA
d.) Horizontal Bracing	NA
e.) Fasteners	NA
f.)	NA

Note: Undermining rated as YES or NO

4. Fender System

a.) Piles	
b.) Diagonal Bracing	
c.) Horizontal Bracing	
d.) Wales	
e.) Fasteners	
f.) Ladders	
g.)	
h.)	

Item 61 (Underwater)

Channel and Channel Pro

1. Debris	7
2. Aggradation	8
3. Utilities	X
4. Rip Rap	7
5.	NA
6.	NA

Item 113 Scour Critica

Scour

a.) Footing Exposed

b.) Undermining

Scour Countermeasures

a.) Sheeting

b.) Rip Rap

c.) Other

Y=YES N=

Submitted by: R. Bonica

X=UNKNOWN NA=NOT APPLICABLE IA=INACCESSIBLE

PAGE 5 OF 11

B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION DATE
3EW	B-16-176	431 896 W12 101	December 22, 1997

REMARKS & PHOTOS:

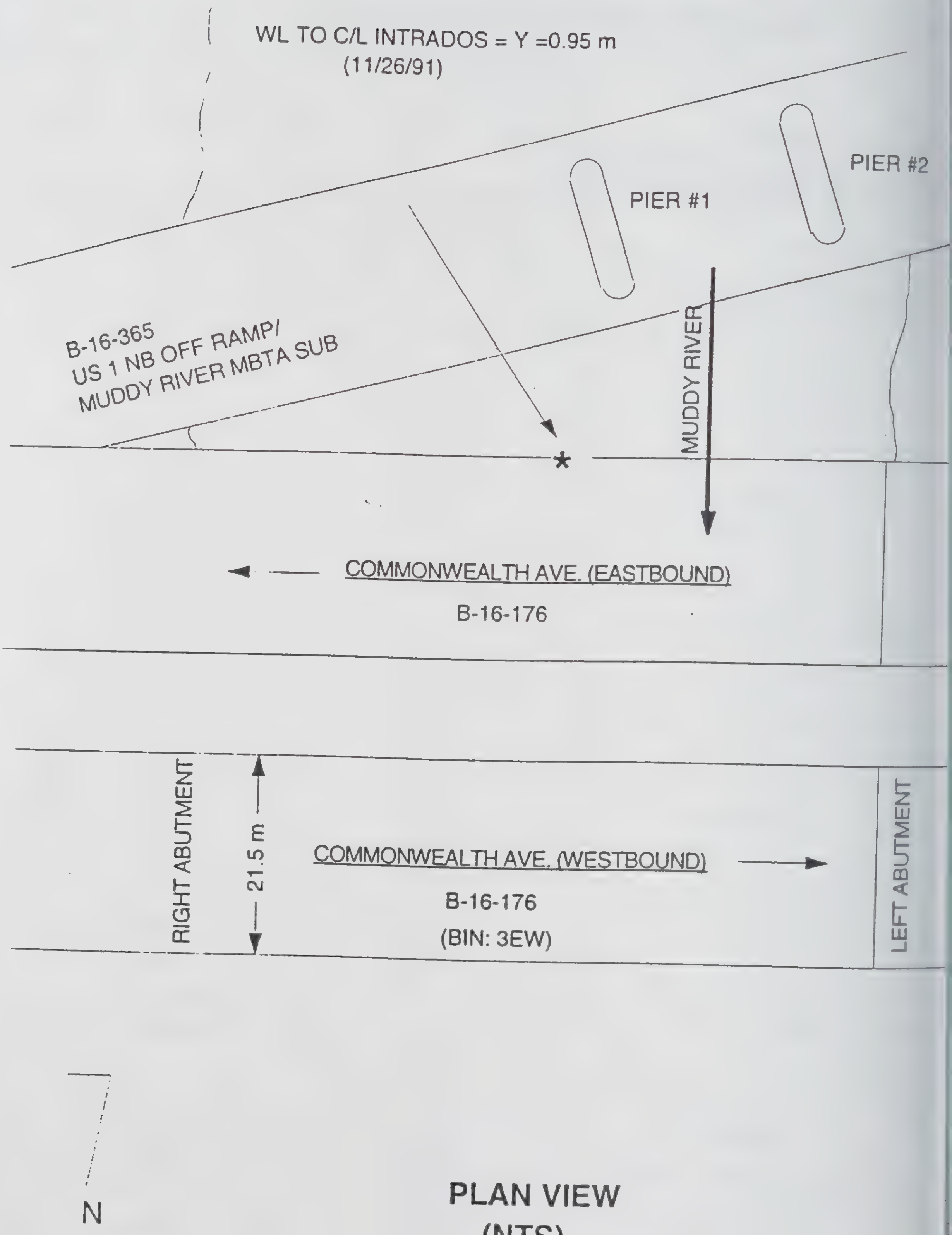
icture with granite block abutments and concrete bridge seats.
abrasion at the waterline (0.5 m H) and at interface of granite blocks and concrete, both

osed, no undermining.
tration between granite blocks is 0.5 m.
concrete deterioration at the waterline, 0.7 m from the upstream end. (0.4 m L x 0.3 m H x

:
sed, no undermining.
ranite blocks are generally tight, maximum penetration is 0.4 m.

Page 5 of 11

BOSTON B-16-176(WB) BIN: 3EW 12/22



PLAN VIEW
(NTS)

NOTES:
1. ALL MEASUREMENTS ARE IN METRIC.

SCOUR MONITORING CHART
UPSTREAM END

	11/26/91	12/10/94	12/22/97
	0.5 m	0.5 m	0.4 m
	1.9 m	1.9 m	1.9 m
	0.3 m	0.4 m	0.6 m
	0.95 m	1.01 m	1.1 m
OR	---	+0.06 m	+0.15 m

EMENTS ARE IN METRIC.
TO C/L INTRADOS , UPSTREAM END, EASTBOUND BRIDGE = Y = 0.95 m

alled 'extremely high'

By Indira A.R. Lakshmanan
GLOBE STAFF

The Muddy River, which runs
ough Boston and Brookline from
naica Pond to the Charles River,
tains "extremely high" levels of
teria that can cause gangrene and
sentery, according to laboratory
ts released yesterday.

In one spot in Brookline, bacteria
els were found to be 21 times high-
than at sewage outfall sites in Bos-
Harbor or anywhere else in the re-
n, according to a citizens' environmental group that commissioned the tests.

"Even one drop of water as contaminated as this is dangerous to people with low immune systems, children or HIV-positive people," said Irene Gillis, chairwoman of Restore Olmsted's Waterway. Speaking at a conference on the Muddy River held at Harvard's School of Public Health yesterday, she and other activists warned residents not to swim in the water, eat fish caught there or even touch the water.

MUDDY, Page B4

Boston Globe 11/17/96

---

show high poll

■ MUDDY
Continued from Page B1

"Even if your dog runs through this water and you pet him, he can bring waterborne disease into your home," Gillis said.

Restore Olmsted's Waterway is a citizens' group dedicated to cleaning up the Muddy River, the 3½-mile waterway that snakes through the Emerald Necklace of parks and green space designed 100 years ago by Frederick Law Olmsted.

The group's decade-long fight over the Muddy took on renewed importance in the last few weeks when the reed-choked and sewage-contaminated river flooded into residential basements and subway stations. The river has flooded twice in the last two months and polluted water from the Muddy flows into the Charles River.

Former Gov. Michael S. Dukakis, in an interview at the conference, faulted his successor in the State House for not taking leadership in stopping pollution of a riverway that passes close to the homes of thousands of Boston and Brookline residents.

"This is a state responsibility, and you know who should be here? The guy in the governor's office. It's one thing to say you care about the environment, and it's another to put your money where your mouth is," Dukakis said of Gov. William F. Weld.

"If he had taken a dive in [the Muddy River] at Charlesgate, he'd never have come up," Dukakis said in a mocking reference to Weld's much-hyped splash into the Charles River after signing a rivers protection hill.

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Samples tak
sediment at the
lands Road brid
the town's wate
found 63,000 co
clostridium per
which can cause
gastrointestinal
to Fred Youngs,
zens' Environme
Cambridge. That
than the levels
outfalls in the ha

The clostridiu
ence of other pat
bearing organism
A, staphylococcu
Youngs said.

The tests also
els of the waterb
terococcus. In one
was measured at
permitted by Envi
tion Agency guidel

Youngs noted
fecal coliform – w
presence of raw
water – measured
1992 study by the
Engineers was in
tween 1,000 and 2
than EPA guideli
the levels in the C
caused alarm a few

Documents obta
dicate that in 1992,
ously elevated levels
were found in the M
eral officials reject
plans to improve flo
the river.

But damage an
for the MBTA fro
flooding – which for
the Kenmore Square
eral days and disru
200,000 riders – is
between $15 and $20
into question the Arm
gineers' recommend
flood control four ye

Cathleen Dougla
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Element Data Collection Form

Month	Day	Year
12	22	97

dge Number B-16-176(WB)

Town BOSTON

BIN 3EW

District 4

ge Key Number 431 896 W12 101

Inspectors BONICA | FITZGERALD, DONAHUE, SULLIVAN | U/W OPNS

Leader | *Member* | *Agency/Consultant/Dept. Name*

	Units	Env-iron.	Total Quantity	Condition States (Quantity or Percent) * 1	2	3	4	5	Q or P *
	M	2	43	43					Q

etween Quantity and Percent for different Elements.

State Information

BDEPT#= B16176 FHWA Select List= ☐
Town= Boston
B.I.N= 3EW AASHTO= 080.6

Identification

(8) Structure Number 431896W12101
(5) Inventory Route 131000024
(2) State Highway Department District 04
(3) County Code 025 (4) Place code 07000
(6) Features Intersected WATER MUDDY RIVER
(7) Facility Carried HWY COMM AVE
(9) Location .3 MI E OF KENMORE SQ.
(11) Kilometerpoint 0000.000
(12) Base Highway Network ☒
(13) LRS Inventory Route & Subroute
(16) Latitude 42 DEG 20 MIN 6.73 SEC
(17) Longitude 71 DEG 05 MIN 5.34 SEC
(98) Border Bridge State Code Share %
(99) Border Bridge Structure No. #

Structure Type and Material

(43) Structure Type Main: Steel Code 302
Stringer/Girder
(44) Structure Type Appr:
Other Code 000
(45) Number of spans in main unit 001
(46) Number of approach spans 0000
(107) Deck Structure Type - Concrete Cast-in-Place Code 1
(108) Wearing Surface / Protective System:
A) Type of wearing surface - Bituminous Code 6
B) Type of membrane - Preformed Fabric Code 2
C) Type of deck protection - Unknown Code 8

Age and Service

(27) Year Built 1917
(106) Year Reconstructed 1974
(42) Type of Service: On - Highway-Ped
Under - Waterway Code 55
(28) Lanes: On Structure 03 Under structure 00
(29) Average Daily Traffic 019900
(30) Year of ADT 1997 (109) Truck ADT 10 %
(19) Bypass, detour length 002 KM

Geometric Data

(48) Length of maximum span 0016.2 M
(49) Structure Length 00017.7 M
(50) Curb or sidewalk: Left 03.2 M Right 04.6 M
(51) Bridge Roadway Width Curb to Curb 012.2 M
(52) Deck Width Out to Out 021.2 M
(32) Approach Roadway Width (w/shoulders) 012.2 M
(33) Bridge Median - No median Code 0
(34) Skew 00 DEG (35) Structure Flared ☐
(10) Inventory Route MIN Vert Clear 99.99 M
(47) Inventory Route Total Horiz Clear 12.2 M
(53) Min Vert Clear Over Bridge Rdwy 99.99 M
(54) Min Vert Underclear ref N 00.00 M
(55) Min Lat Underclear RT ref N 00.0 M
(56) Min Lat Underclear LT 00.0 M

Navigation Data

(38) Navigation Control - No navigation control on waterway Code 0
(111) Pier Protection Code
(39) Navigation Vertical Clearance 000.0 M
(116) Vert-lift Bridge Nav Min Vert Clear M
(40) Navigation Horizontal Clearance 0000.0 M

Classification

(112) NBIS Bridge Length
(104) Highway System
(26) Functional Class - Urban Arterial
(100) Defense Highway
(101) Parallel Structure
(102) Direction of Traffic - 1-way traffic
(103) Temporary Structure
(105) Federal Lands Highways
(110) Designated National Network
(20) Toll - On free road
(21) Maintain - State Highway Agency
(22) Owner - State Highway Agency
(37) Historical Significance undetermined

Condition

(58) Deck
(59) Superstructure
(60) Substructure
(61) Channel & Channel Protection
(62) Culverts

Load Rating and Posting

(31) Design Load - HS 20
(63) Operating Rating Method Allowable Stress (AS)
(64) Operating Rating
(65) Inventory Rating Method - Allowable Stress (AS)
(66) Inventory Rating
(70) Bridge Posting
(41) Structure - Open

Appraisal

(67) Structural Evaluation
(68) Deck Geometry
(69) Underclearances, vert. and horiz.
(71) Waterway adequacy
(72) Approach Roadway Alignment
(36) Traffic Safety Features
(113) Scour Critical Bridges

Inspections

(90) Inspection Date ~~3/1/96~~ 03-21-98 (91) Fre
(92) Critical Feature Inspection:
(A) Fracture Critical Detail ☐ 00 MO
(B) Underwater Inspection ☒ 36 MO
(C) Other Special Inspection ☐ 00 MO
(*) Critical Member ☐ 00 MO
(*) Closed Bridge ☐ 00 MO
(*) DamageInspection MO

Loads

	H20	Type 3	Type
Operating	33 ✓	61 ✓	
Inventory	23 ✓	34 ✓	

Posting

Status LEGAL Da
2 Axle 3 Axle

Misc.

Bridge Name
☐ Anti-missile fence ☐ Arrow Panel ☐

Accessibility

☐ Liftbucket
☐ Ladder
☒ Boat ✓
☒ Wader ✓
☐ Inspector 50
☐ Rigging
☐ Staging
☐ Traffic Control
☐ RR Flagperson
☐ Police

State Information

	FHWA Select List=	☐
	AASHTO=	080.6

Identification

		431896W12101
		131000024
rtment District		04
25	(4) Place code	07000
		WATER MUDDY RIVER
		HWY COMM AVE
		.3 MI E OF KENMORE SQ.
		0000.000
ork		☒
& Subroute		
		42 DEG 20 MIN 56.73 SEC
		71 DEG 05 MIN 35.34 SEC
Code	Share	%
ure No.	#	

Structure Type and Material

:	Steel	Code	302
	Jointless bridge type:	Not applicable	
:			
		Code	000
main unit			001
spans			0000
pe -	Concrete Cast-in-Place	Code	1
Protective System:			
rface -	Bituminous	Code	6
-	Preformed Fabric	Code	2
ection -	Unknown	Code	8

Age and Service

			1917
d			1974
-	Highway-Ped		
y		Code	55
	03	Under structure	00
ic			019900
	1997	(109) Truck ADT	10 %
th			002 KM

Geometric Data

span			0016.2 M
			00017.7 M
	Left 03.2 M	Right	04.6 M
lth Curb to Curb			012.2 M
Dut			021.2 M
Width (w/shoulders)			012.2 M
o median		Code	0
DEG	(35) Structure Flared		☐
l Vert Clear			99.99 M
al Horiz Clear			12.2 M
Bridge Rdwy			99.99 M
r ref	N		00.00 M
RT ref	N		00.0 M
LT			00.0 M

Navigation Data

No navigation control on waterway	Code	0
	Code	
Clearance		000.0 M
Min Vert Clear		M
al Clearance		0000.0 M

Classification — Code

(112) NBIS Bridge Length		☒
(104) Highway System		☒
(26) Functional Class -	Urban Arterial	14
(100) Defense Highway		0
(101) Parallel Structure		L
(102) Direction of Traffic -	1-way traffic	1
(103) Temporary Structure		☐
(105) Federal Lands Highways		0
(110) Designated National Network		☐
(20) Toll -	On free road	3
(21) Maintain -	State Highway Agency	01
(22) Owner -	State Highway Agency	01
(37) Historical Significance	undetermined	

Condition — Code

(58) Deck	8
(59) Superstructure	7
(60) Substructure	7
(61) Channel & Channel Protection	7
(62) Culverts	N

Load Rating and Posting — Code

(31) Design Load -	HS 20	5
(63) Operating Rating Method	Allowable Stress (AS)	2
(64) Operating Rating		53.2
(65) Inventory Rating Method -	Allowable Stress (AS)	2
(66) Inventory Rating		33.6
(70) Bridge Posting		5
(41) Structure -	Open	A

Appraisal — Code

(67) Structural Evaluation	7
(68) Deck Geometry	4
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	8
(72) Approach Roadway Alignment	8
(36) Traffic Safety Features	1 N N N
(113) Scour Critical Bridges	8

Inspections

(90) Inspection Date 3/2/98 (91) Frequency 24 MO

(92) Critical Feature Inspection:				(93) CFI DATE
(A) Fracture Critical Detail	☐	00	MO A)	00/00/00
(B) Underwater Inspection	☒	36	MO B)	12/22/97
(C) Other Special Inspection	☐	00	MO C)	00/00/00
(*) Critical Member	☐	00	MO *)	00/00/00
(*) Closed Bridge	☐	00	MO *)	00/00/00
(*) DamageInspection			MO *)	00/00/00

Loads

	H20	Type 3	Type 3S2	Type HS
Operating	33	61	92	59
Inventory	23	34	52	37

Posting

Status LEGAL Date 10/14/97

2 Axle 3 Axle 5 Axle

Misc.

Bridge Name

☐ Anti-missile fence ☐ Acrow Panel ☐ Integral Bridge

Accessibility

☐ Liftbucket	☐ Rigging	Inspection
☐ Ladder	☐ Staging	Hours: 12
☒ Boat	☐ Traffic Control	
☒ Wader	☐ RR Flagperson	
☐ Inspector 50	☐ Police	

Report Date: June 6, 2000

State Information

BDEPT#=B16176 FHWA Select List= N

Town=Boston

B.I.N=3EW AASHTO= 080.6

Identification

(8) Structure Number 431896W12101

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(6) Features Intersected WATER MUDDY RIVER

(7) Facility Carried HWY COMM AVE

(9) Location .3 MI E OF KENMORE SQ.

(11) Kilometerpoint 0000.000

(12) Base Highway Network Y

(13) LRS Inventory Route & Subroute

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(17) Longitude 71 DEG 05 MIN 35.34 SEC

(98) Border Bridge State Code Share %

(99) Border Bridge Structure No. #

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Stringer/Girder Jointless bridge type: Not applicable

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Other Code 000

(45) Number of spans in main unit 001

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Under - Waterway Code 55

(28) Lanes: On Structure 03 Under structure 00

(29) Average Daily Traffic 020900

(30) Year of ADT 2000 (109) Truck ADT 13 %

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(32) Approach Roadway Width (w/shoulders) 012.2 M

(33) Bridge Median - No median Code 0

(34) Skew 00 DEG (35) Structure Flared N

(10) Inventory Route MIN Vert Clear 99.99 M

(47) Inventory Route Total Horiz Clear 12.2 M

(53) Min Vert Clear Over Bridge Rdwy 99.99 M

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(60) Substructure

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(62) Culverts

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(63) Operating Rating Method Allowable Stress (A

(64) Operating Rating

(65) Inventory Rating Method - Allowable Stress (A

(66) Inventory Rating

(70) Bridge Posting

(41) Structure - Open

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(67) Structural Evaluation

(68) Deck Geometry

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(71) Waterway adequacy

(72) Approach Roadway Alignment

(36) Traffic Safety Features

(113) Scour Critical Bridges

Inspections

(90) Inspection Date 03/14/2000 (91)

(92) Critical Feature Inspection:

(A) Fracture Critical Detail N 00

(B) Underwater Inspection Y 36

(C) Other Special Inspection N 00

(*) Other Inspection N 00

(*) Closed Bridge N 00

(*) Damage Inspection

Loads

Date 00/00/00	H20	Type 3	T
Operating	33	61	
Inventory	23	34	

Posting

Status LEGAL

2 Axle 3 Axle

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel

Accessibility

N Liftbucket N Rigging

N Ladder N Staging

Y Boat N Traffic Contr

N Wader N RR Flagperso

N Inspector 50 N Police

MASSACHUSETTS HIGHWAY DEPARTMENT

UNDERWATER OPERATIONS TEAM
DIVERS ACTIVITY REPORT

bridge dept. no.
B-16-176

	5-facility carried COMMONWEALTH AVE. (EB)	6-features intersected MUDDY RIVER	93b-date inspected 12/22/97
tructure no. 896 E12 101	foundation type	dive master R. BONICA	
el	access to bridge EMBANKMENT	team members J. FITZGERALD, J. DONAHUE, B. SULLIVAN	

ions L, BOULDERS, MUD	water conditions HIGH BACTERIA POLLUTION	depth 1.5 m+/-	visibility 1 m +/-	current NIL

60 (Underwater) **7**

ucture

tments

gs	7
astwall	7
nting	7
tings	IA
s	X
ur	8
lermining	NO
lement	8
	NA
	NA

s or Bents

n	NA
nting	NA
mn	NA
ing	NA
	NA
r	NA
ermining	NA
ement	NA
	NA

Bents

crete Piles	NA
er Piles	NA
onal Bracing	NA
zontal Bracing	NA
eners	NA
	NA

ermining rated as YES or NO

4. Fender System

a.) Piles	NA
b.) Diagonal Bracing	NA
c.) Horizontal Bracing	NA
d.) Wales	NA
e.) Fasteners	NA
f.) Ladders	NA
g.)	NA
h.)	NA

Item 61 (Underwater) **7**

Channel and Channel Protection

1. Debris	7
2. Aggradation	8
3. Utilities	X
4. Rip Rap	7
5.	NA
6.	NA

Item 113 **Scour Critical Bridges**

Scour

a.) Footing Exposed	N
b.) Undermining	N

Scour Countermeasures

a.) Sheeting	Y
b.) Rip Rap	Y
c.) Other	N

Y=YES N=NO

Submitted by: R. Bonica

IOWN NA=NOT APPLICABLE IA=INACCESSIBLE

FILE

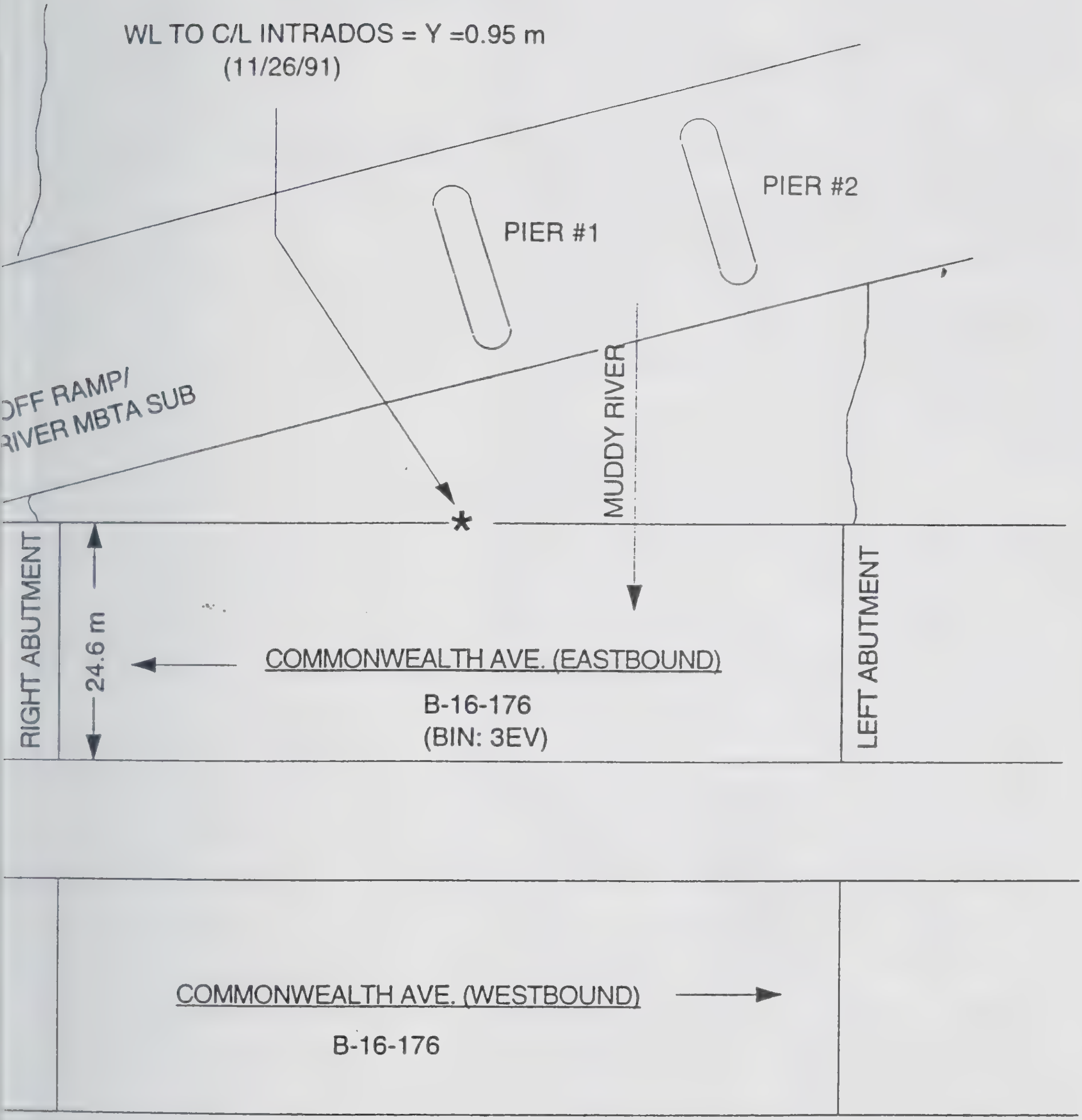
CITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECT
BOSTON	3EV	B-16-176	431 896 E12 101	Decem

REMARKS & PHOTOS

Single span structure with granite block abutments and concrete bridge seats.
There is minor abrasion at the waterline (0.5 m H) and at the interface of granite blocks a
abutments.

Right Abutment:
No footing exposed, no undermining.
Granite blocks extend beyond the concrete cap 0.5 m +/-.
Maximum penetration between granite blocks is 0.09 m.
There is wood sheeting exposed between 4.6 m and 9.8 m from upstream end, 0.3 m +/- hig

Left Abutment:
No footing exposed, no under~~e~~mining.
Joints between granite blocks are generally tight.



PLAN VIEW
(NTS)

Ⓐ

SCOUR MONITORING CHART
UPSTREAM END

	11/26/91	12/10/94	12/22/97
LEFT ABUTMENT	0.3 m	0.3 m	0.7 m
C/L SPAN	1.7 m	1.8 m	1.8 m
RIGHT ABUTMENT	0.4 m	0.4 m	0.5 m
Y	0.95 m	1.01 m	1.1 m
CORRECTION FACTOR	- - -	+0.06 m	+0.15 m

NOTES:

1. *ALL MEASUREMENTS ARE IN METRIC.*
2. *WATERLINE TO C/L INTRADOS, UPSTREAM END, EASTBOUND BRIDGE = Y (11/26/91)*

tremely high'

-runs
from
iver,
s of
and
tory

eria
igh-
Bos-
re-
ron-

mental group that commissioned the tests.

"Even one drop of water as contaminated as this is dangerous to people with low immune systems, children or HIV-positive people," said Irene Gillis, chairwoman of Restore Olmsted's Waterway. Speaking at a conference on the Muddy River held at Harvard's School of Public Health yesterday, she and other activists warned residents not to swim in the water, eat fish caught there or even touch the water.

MUDDY, Page B4

11/17/96

show high pollution

■ MUDDY

Continued from Page B1

"Even if your dog runs through this water and you pet him, he can bring waterborne disease into your home," Gillis said.

Restore Olmsted's Waterway is a citizens' group dedicated to cleaning up the Muddy River, the 3½-mile waterway that snakes through the Emerald Necklace of parks and green space designed 100 years ago by Frederick Law Olmsted.

The group's decade-long fight over the Muddy took on renewed importance in the last few weeks when the reed-choked and sewage-contaminated river flooded into residential basements and subway stations. The river has flooded twice in the last two months and polluted water from the Muddy flows into the Charles River.

Former Gov. Michael S. Dukakis, in an interview at the conference, faulted his successor in the State House for not taking leadership in stopping pollution of a riverway that passes close to the homes of thousands of Boston and Brookline residents.

"This is a state responsibility, and you know who should be here? The guy in the governor's office. It's one thing to say you care about the environment, and it's another to put your money where your mouth is," Dukakis said of Gov. William F. Weld.

"If he had taken a dive in [the Muddy River] at Charlesgate, he'd never have come up," Dukakis said in a mocking reference to Weld's much-hyped splash into the Charles River after signing a rivers protection bill.

But Weld's spokesman, Bob Bliss, expressed disbelief that Dukakis would wag a finger at Weld.

"I'm surprised that Gov. Dukakis, who was a few days late and a couple of hundred million dollars short in cleaning up Boston Harbor, would be criticizing anyone on an environmental cleanup," Bliss said.

Rick Lombardi, a spokesman for the state Executive Office of Environmental Affairs, insisted that Weld "has taken the initiative" to clean up the river. "We have appointed a mediator to work with a multitude of groups, the city of Boston, Massachusetts Water Resources Authority and the Army Corps of Engineers to try to bring a plan into action," he said.

Samples taken last month from sediment at the base of the Netherlands Road bridge in Brookline, near the town's water and sewer works, found 63,000 colonies per gram of clostridium perfringens bacteria, which can cause gas gangrene and gastrointestinal disorders, according to Fred Youngs, director of the Citizens' Environmental Laboratory in Cambridge. That is 21 times higher than the levels recorded at sewage outfalls in the harbor, he said.

The clostridium signals the presence of other pathogens or disease-bearing organisms such as hepatitis A, staphylococcus and salmonella, Youngs said.

The tests also found elevated levels of the waterborne pathogen enterococcus. In one spot, the bacteria was measured at 5 ½ times the level permitted by Environmental Protection Agency guidelines.

Youngs noted that the levels of fecal coliform – which indicates the presence of raw human sewage in water – measured in the Muddy in a 1992 study by the Army Corps of Engineers was in some cases between 1,000 and 2,500 times higher than EPA guidelines, outstripping the levels in the Charles River that caused alarm a few months ago.

Documents obtained recently indicate that in 1992, when the dangerously elevated levels of fecal coliform were found in the Muddy River, federal officials rejected as too costly plans to improve flood control along the river.

But damage and cleanup costs for the MBTA from last month's flooding – which forced the closing of the Kenmore Square station for several days and disrupted service for 200,000 riders – is expected to run between $15 and $20 million, calling into question the Army Corps of Engineers' recommendation rejecting flood control four years ago.

Cathleen Douglas Stone, environmental services director for the city of Boston, said Mayor Thomas M. Menino has a commitment to preserving open space in the city, and is studying ways to limit pollution of the Muddy, from reducing or eliminating discharge into the river to keeping Boston streets cleaner so garbage won't blow into the river.

Dr. Alan Balsam, director of Brookline's Public Health Department, warned that people should be cautious about recreational activity near the Muddy.

But Balsam added that Brookline aims within the next year and a half to fix all 39 improper sewer hookups or discharges that are polluting the Muddy with sewage.

PAGE 5 OF 5

Element Data Collection Form

Month	Day	Year
12	22	97

dge Number B-16-176

Town BOSTON

BIN 3EV

District 4

ge Key Number 431 896 E12 101

Inspectors	BONICA	FITZGERALD, DONAHUE, SULLIVAN	U/W OPNS
	Leader	*Member*	*Agency/Consultant/Dept. Name*

		Env-	Total	Condition States (Quantity or Percent) *					Q or
	Units	iron.	Quantity	1	2	3	4	5	P *
	M	2	49.2	49.2					Q

etween Quantity and Percent for different Elements.

MASSACHUSETTS HIGHWAY DEPARTMENT
STRUCTURES INSPECTION FIELD REPORT
ROUTINE INSPECTION

PAGE 1 OF 11

BR. DEPT. NO.
B-16-176

	8-STRUCTURES NO. 431-896-E12-101	11-KILOM PT 0000.000	41-STATUS OPEN	90-ROUTINE INSP DATE 03/02/98
EALTH AVE.	MEMORIAL NAME/LOCAL NAME	27-YR BUILT 1917	106-YR REBUILT 1974	YR REHAB'D (NON 106)
VER	26-FUNCTIONAL CLASS. URBAN ARTERIAL	DIST. BRIDGE INSPECTION ENGINEER		
	22-OWNER STATE	21-MAINTAINER STATE	TEAM LEADER	
IN PLACE	WEATHER FAIR	TEMP[a] 40	TEMP[c]	TEAM MEMBERS J.WELCH

		DEF
	8	
	6	M/P
	8	
	N	
	7	M/P
	N	
	7	M/P
	7	M/P
	7	
	N	
	4	M/P
	N	
	7	
	H	

N/E 152 S/W 152

		DEF
	7	M/P
	7	M/P
	7	

(Y/N) N

		DEF
	N	
	N	
	N	

ITEM 59 7
SUPERSTRUCTURE

			DEF
1. Stringers		7	M/P
2. Floorbeams		N	
3. Floor System Bracing		N	
4. Girders or Beams		7	M/P
5. Trusses - General		N	
a. Upper Chords	N		
b. Lower Chords	N		
c. Web Members	N		
d. Lateral Bracings	N		
e. Sway Bracings	N		
f. Portals	N		
g. End Posts	N		
6. Pin & Hangers		N	
7. Conn Plt's, Gussets & Angles		N	
8. Cover Plates		N	
9. Bearing Devices		N	
10. Diaphragms/Cross Frames		7	
11. Rivets & Bolts		7	
12. Welds		7	
13. Member Alignment		8	
14. Paint/ Coating		5	M/P
15.			
Year Painted:		X	

COLLISION DAMAGE: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )
LOAD DEFLECTION: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )
LOAD VIBRATION: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

Any Fracture Critical Member : (Y/N) N
Any Cracks : (Y/N) N

ITEM 60 7
SUBSTRUCTURE

			DEF
1. Abutments		7	
a. Wingwalls	7		M/P
b. Backwalls	7		
c. Breastwalls	7		
d. Bridge Seats	7		
e. Pedestals	N		
f. Footings	H		
g. Piles	N		
2. Piers or Bents		N	
a. Caps	N		
b. Pedestals	N		
c. Columns	N		
d. Webs	N		
e. Footings	N		
f. Piles	N		
3. Pile Bents		N	
a. Piles	N		
b. Diagonal Bracing	N		
c. Horizontal Bracing	N		
d. Fasteners	N		
4. Settlement		7	
5. Pointing		N	
6. Erosion		7	
7. Debris on Seats		7	
8. Slope Paving		N	
9.			
10.			

COLLISION DAMAGE:
None (X) Minor ( ) Moderate ( ) Severe ( )
UNDERMINING (Y/N) If YES please explain N
SCOUR:
None (X) Minor ( ) Moderate ( ) Severe ( )

ITEM 60 FROM U/W INSP. 7

93b-U/W INSP DATE: 12/22/97

N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	90- INSPE
BOSTON	3EV	B-16-176	431-896-E12-101	

ITEM 61 *CHANNEL & CHANNEL PROTECTION* 7 *DEF*

1. Channel Scour	7		
2. Embankment Erosion	7		
3. Debris	6		M/P
4. Vegetation	7		
5. Utilities	N		
6 Hydraulic Adequacy	7		
7. Spur Dikes & Jetties	N		
8. Rip Rap & Slope Protection	7		
9. Fender System	N		
10. Effectiveness/Alignment	7		

STREAM FLOW VELOCITY:
Tidal ( ) High ( ) Moderate ( ) Low (X)

ITEM 61 FROM U/W INSP. 7

93b-U/W INSP. DATE 12/22/97

ITEM 36 *TRAFFIC SAFETY*

	36	*COND*	*DEF*
1. Bridge Railing	1	7	
2. Transitions	N	-	
3. Approach Guardrail	N	-	
4. Approach Guardrail Ends	N	-	

WEIGHT POSTING: *Not Applicable* ☒

	H	3	3S2	SINGLE
Actual Posting				
Recommended Posting from Rating Book				

Waived Date: EJDMT Date:

	At bridge N/E	*At bridge* S/W	*Advance* N/E	*Advance* S/W
Signs In Place (Y=Yes N=No)				
Legibility/ Visibility				

CLEARANCE POSTING: *Not Applicable* ☒

	ft	in
Actual Field Measurement		
Posted Clearance		

	At bridge N/E	*At bridge* S/W	*Advance* N/E	*Advance* S/W
Signs In Place (Y=Yes N=No)				
Legibility/ Visibility				

ACCESSIB

Lift Bucket	
Ladder	
boat	
Wader	
Inspector 50	
Rigging	
Staging	
Traffic Contro	
U/W Inspectio	
RR Flagger	
Police	
Other:	

TOTAL HO

PLANS:

(V.C.R.):

TAPE #:

List of Field Te

RATING:
Rating Report (Y/N): Y
Date: 10/97

Request for Rating or Rerating (Y/N): N
Reason:

If YES please give priority:
HIGH ( ) MEDIUM ( ) LOW ( )

CONDITION RATING GUIDE

(For Items 58, 59, 60 and 61)

	CODE	*CONDITION*	*DEFECTS*
	N	NOT APPLICABLE	
G	9	EXCELLENT	Excellent condition.
G	8	VERY GOOD	No problem noted.
G	7	GOOD	Some minor problems.
F	6	SATISFACTORY	Structural elements show some minor deterioration.
F	5	FAIR	All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
P	4	POOR	Advance section loss, deterioration, spalling or scour.
P	3	SERIOUS	Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are in steel or shear cracks in concrete may be present.
C	2	CRITICAL	Advance deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is
C	1	"IMMINENT" FAILURE	Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement Bridge is closed to traffic but corrective action may put it back in light service.
	0	FAILED	Out of service - beyond corrective action.

DEFICIENCY REPORTING GUIDE

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency -(Examples include but are not limited to: Spalled concrete, minor pot holes, minor corrosion to steel, minor scouring, clogged guardrail, etc.)

S= Severe/Major Deficiency - (Examples include but are not limited to: Large spalls, wide cracks, moderate to major deterioration in concrete, considerable scouring or undermining, moderate to extensive corrosion to steel, etc.)

C= Critical Deficiency - A deficiency in a structural component or element of a bridge that poses an extreme hazard or unsafe condition **(Follow-Up Critical Deficiency Report must be submitted separately)**

URGENCY OF REPAIR:

I= Immediate, [Inspector(s) stay at the bridge until District Maintenance crew or the responsible Agency crew (if not a State bridge) show up and corrective

A= As soon as possible, [Action will be taken by District Maintenance Engineer or the Responsible Agency (if not a State owned bridge) upon receipt of

P= Prioritize, [Shall be prioritized by District Maintenance Engineer or the Responsible Agency (if not a State owned bridge) and repairs be made when available].

	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION DATE
	3EV	B-16-176	431-896-E12-101	03/02/98

REMARKS & PHOTOS

T REQUIRED

ETY FEATURES

E ENCASED BALUSTRADES AND RAIL
T EXIST
T EXIST
T EXIST

AVEL LANES AT RANDOM AREAS HAVE BUNCHED UP BITUMINOUS
ERE IS FULL WIDTH TRANSVERSE CRACKING OVER BOTH ABUTMENTS.

ES IN GRANITE CURBING AT ALL FOUR CORNERS

ENGTH LIGHT LONGITUDINAL CRACK AT NORTH SIDEWALK; SOUTH
HT LONGITUDINAL CRACK 12m LONG.

APETS CONTAIN LIGHT VERTICAL CRACKS.

AT ROADWAY LEVEL COMPLETELY CLOGGED.

ACH LIGHT TRANSVERSE CRACKS
LEMENT AT SOUTHEAST END AND MINOR DEPRESSION AT NORTHEAST END.

TURE

VERALL CONDITION REMAINS GOOD WITH ONLY PROBLEM NOTED BEING
AND PEELING OF PAINT THROUGHOUT.

RE

IAGONAL CRACK AT SOUTHWEST WING 460mm LONG.

D CHANNEL PROTECTION

EBRIS PAPERS AND SOME BROKEN BRANCHES.

A

2- district	4

MASSACHUSETTS HIGHWAY DEPARTMENT

UNDERWATER OPERATIONS TEAM

DIVERS ACTIVITY REPORT

4-city/town BOSTON	5-facility carried COMMONWEALTH AVE. (WB)	6-features intersected MUDDY RIVER

bin no. 3EW	8-structure no. 431 896 W12 101	foundation type	dive master R. BONICA

inspection level II	access to bridge EMBANKMENT	team members J. FITZGERALD, J. DONAHUE, B. SULLIVAN

bottom conditions SILT, GRAVEL, BOULDERS, MUD	water conditions HIGH BACTERIA POLLUTION	depth 1.5 m+/-	visibility 1 m +/-	cu NI

Item 60 (Underwater) Substructure 7

1. Abutments	
a.) Wings	7
b.) Breastwall	7
c.) Pointing	6
d.) Footings	IA
e.) Piles	X
f.) Scour	8
g.) Undermining	NO
h.) Settlement	8
i.)	NA
j.)	NA
2. Piers or Bents	
a.) Stem	NA
b.) Pointing	NA
c.) Column	NA
d.) Footing	NA
e.) Piles	NA
f.) Scour	NA
g.) Undermining	NA
h.) Settlement	NA
i.)	NA
3. Pile Bents	
a.) Concrete Piles	NA
b.) Timber Piles	NA
c.) Diagonal Bracing	NA
d.) Horizontal Bracing	NA
e.) Fasteners	NA
f.)	NA

Note: Undermining rated as YES or NO

4. Fender System

a.) Piles	
b.) Diagonal Bracing	
c.) Horizontal Bracing	
d.) Wales	
e.) Fasteners	
f.) Ladders	
g.)	
h.)	

Item 61 (Underwater)

Channel and Channel Prot

1. Debris	7
2. Aggradation	8
3. Utilities	X
4. Rip Rap	7
5.	NA
6.	NA

Item 113 Scour Critical

Scour

a.) Footing Exposed

b.) Undermining

Scour Countermeasures

a.) Sheeting

b.) Rip Rap

c.) Other

Y=YES N=N

Submitted by: R. Bonica

X=UNKNOWN NA=NOT APPLICABLE IA=INACCESSIBLE

PAGE 5 OF 11

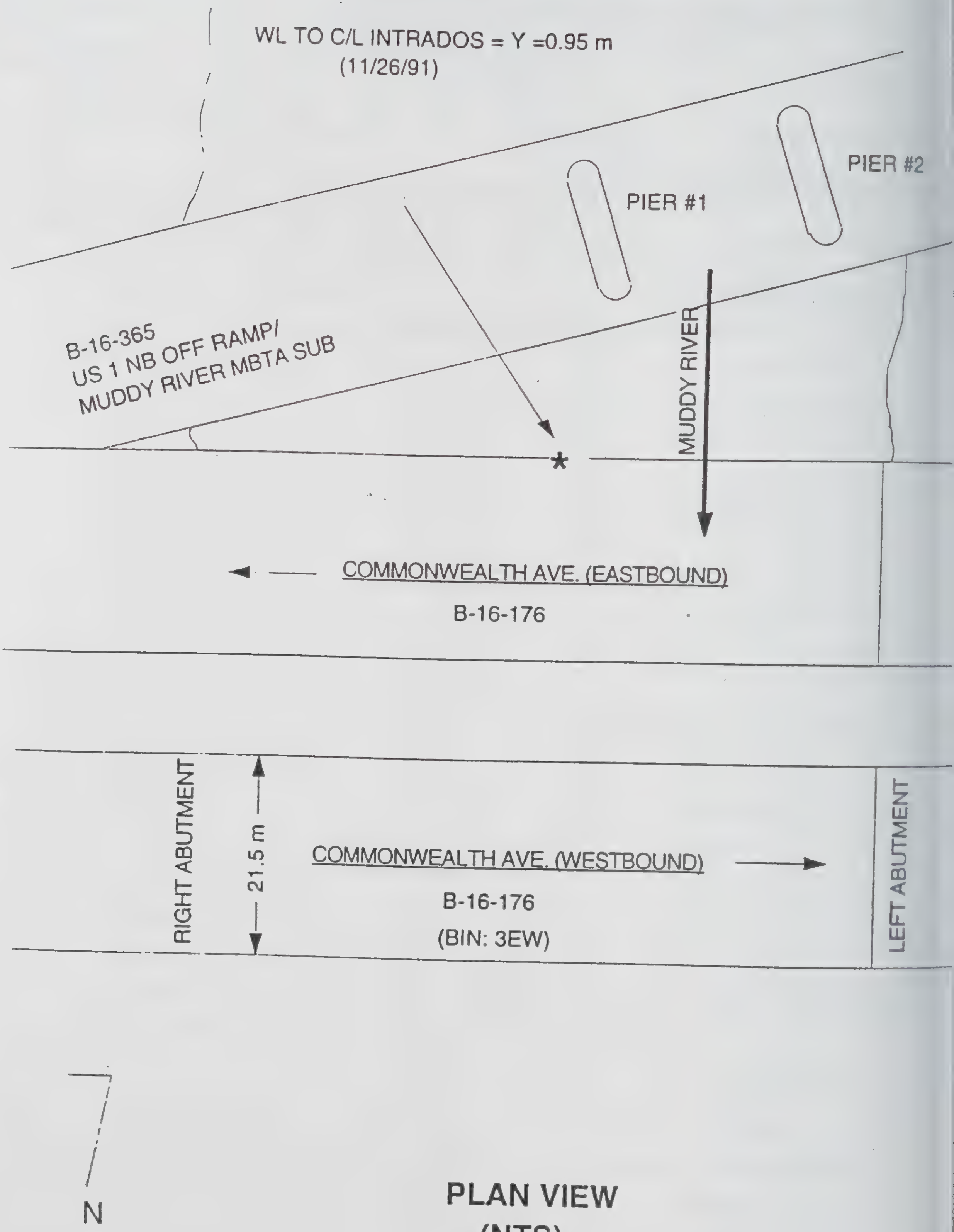
B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION DATE
3EW	B-16-176	431 896 W12 101	December 22, 1997

REMARKS & PHOTOS:

cture with granite block abutments and concrete bridge seats.
abrasion at the waterline (0.5 m H) and at interface of granite blocks and concrete, both

sed, no undermining.
ation between granite blocks is 0.5 m.
oncrete deterioration at the waterline, 0.7 m from the upstream end. (0.4 m L x 0.3 m H x

ed, no undermining.
anite blocks are generally tight, maximum penetration is 0.4 m.



PLAN VIEW
(NTS)

NOTES:
1. ALL MEASUREMENTS ARE IN METRIC.

SCOUR MONITORING CHART
UPSTREAM END

	11/26/91	12/10/94	12/22/97
	0.5 m	0.5 m	0.4 m
	1.9 m	1.9 m	1.9 m
	0.3 m	0.4 m	0.6 m
	0.95 m	1.01 m	1.1 m
R	- - -	+0.06 m	+0.15 m

EMENTS ARE IN METRIC.

O C/L INTRADOS , UPSTREAM END, EASTBOUND BRIDGE = Y = 0.95 m

alled ‘extremely high’

A

By Indira A.R. Lakshmanan
GLOBE STAFF

The Muddy River, which runs
ough Boston and Brookline from
naica Pond to the Charles River,
tains “extremely high” levels of
teria that can cause gangrene and
sentery, according to laboratory
ts released yesterday.

In one spot in Brookline, bacteria
els were found to be 21 times high-
han at sewage outfall sites in Bos-
Harbor or anywhere else in the re-
n, according to a citizens' environmental group that commissioned the tests.

“Even one drop of water as contaminated as this is dangerous to people with low immune systems, children or HIV-positive people,” said Irene Gillis, chairwoman of Restore Olmsted's Waterway. Speaking at a conference on the Muddy River held at Harvard's School of Public Health yesterday, she and other activists warned residents not to swim in the water, eat fish caught there or even touch the water.

MUDDY, Page B4

Boston Globe 11/17/96

---

show high poll

■ MUDDY
Continued from Page B1

“Even if your dog runs through this water and you pet him, he can bring waterborne disease into your home,” Gillis said.

Restore Olmsted's Waterway is a citizens' group dedicated to cleaning up the Muddy River, the 3½-mile waterway that snakes through the Emerald Necklace of parks and green space designed 100 years ago by Frederick Law Olmsted.

The group's decade-long fight over the Muddy took on renewed importance in the last few weeks when the reed-choked and sewage-contaminated river flooded into residential basements and subway stations. The river has flooded twice in the last two months and polluted water from the Muddy flows into the Charles River.

Former Gov. Michael S. Dukakis, in an interview at the conference, faulted his successor in the State House for not taking leadership in stopping pollution of a riverway that passes close to the homes of thousands of Boston and Brookline residents.

“This is a state responsibility, and you know who should be here? The guy in the governor's office. It's one thing to say you care about the environment, and it's another to put your money where your mouth is,” Dukakis said of Gov. William F. Weld.

“If he had taken a dive in [the Muddy River] at Charlesgate, he'd never have come up,” Dukakis said in a mocking reference to Weld's much-hyped splash into the Charles River after signing a rivers protection bill.

But Weld's spokesman, Bob Bliss, expressed disbelief that Dukakis would wag a finger at Weld.

“I'm surprised that Gov. Dukakis, who was a few days late and a couple of hundred million dollars short in cleaning up Boston Harbor, would be criticizing anyone on an environmental cleanup,” Bliss said.

Rick Lombardi, a spokesman for
the state Exec
ronmental Af
Weld “has tak
clean up the r
pointed a medi
multitude of gro
ton, Massachuse
Authority and
Engineers to try
action,” he said.

Samples tak
sediment at the
lands Road bridg
the town's wate
found 63,000 co
clostridium per
which can cause
gastrointestinal
to Fred Youngs,
zens' Environme
Cambridge. That
than the levels
outfalls in the ha

The clostridiu
ence of other pat
bearing organism
A, staphylococcus
Youngs said.

The tests also
els of the waterb
terococcus. In one
was measured at 6
permitted by Envi
tion Agency guidel

Youngs noted
fecal coliform – w
presence of raw
water – measured
1992 study by the
Engineers was in
tween 1,000 and 2,
than EPA guideli
the levels in the C
caused alarm a few

Documents obta
dicate that in 1992,
ously elevated levels
were found in the M
eral officials reject
plans to improve flo
the river.

But damage an
for the MBTA fro
flooding – which forc
the Kenmore Square
eral days and disru
200,000 riders – is
between $15 and $2
into question the Ar
gineers' recommen
flood control four ye

Cathleen Dougl
ronmental services
city of Boston, said
M. Menino has a com
serving open space in
studying ways to lin
the Muddy, from rec
nating discharge int
keeping Boston stre
garbage won't blow i

Dr. Alan Balsa
Brookline's Public
ment, warned that pe
cautious about recre
near the Muddy.

But Balsam added
aims within the next
to fix all 39 improper
or discharges that a
Muddy with sewage.

Element Data Collection Form

Month	Day	Year
12	22	97

ge Number B-16-176(WB)

Town BOSTON

BIN 3EW

District 4

e Key Number 431 896 W12 101

Inspectors BONICA — Leader; FITZGERALD, DONAHUE, SULLIVAN — Member; U/W OPNS — Agency/Consultant/Dept. Name

		Env-	Total	Condition States (Quantity or Percent) *					Q or
	Units	iron.	Quantity	1	2	3	4	5	P *
.	M	2	43	43					Q

ween Quantity and Percent for different Elements.

Page 9 of 11

State Information

BDEPT#= B16176 FHWA Select List= ☐

P

Town= Boston

B.I.N= 3EV AASHTO= 083.0

Identification

(8) Structure Number 431896E12101

(5) Inventory Route 131000022

(2) State Highway Department District 04

(3) County Code 025 (4) Place code 07000

(6) Features Intersected WATER MUDDY RIVER

(7) Facility Carried HWY COMM AVE

(9) Location .3 MI E OF KENMORE SQ.

(11) Kilometerpoint 0000.000

(12) Base Highway Network ☒

(13) LRS Inventory Route & Subroute

(16) Latitude 42 DEG 20 MIN 5.46 SEC

(17) Longitude 71 DEG 05 MIN 5.28 SEC

(98) Border Bridge State Code Share %

(99) Border Bridge Structure No. # '

Structure Type and Material

(43) Structure Type Main: Steel Code 302

Stringer/Girder Not applicable

(44) Structure Type Appr:

Other Code 000

(45) Number of spans in main unit 001

(46) Number of approach spans 0000

(107) Deck Structure Type - Concrete Cast-in-Place Code 1

(108) Wearing Surface / Protective System:

A) Type of wearing surface - Bituminous Code 6

B) Type of membrane - Preformed Fabric Code 2

C) Type of deck protection - Unknown Code 8

Age and Service

(27) Year Built 1917

(106) Year Reconstructed 1974

(42) Type of Service: On - Highway-Ped

Under - Waterway Code 55

(28) Lanes: On Structure 04 Under structure 00

(29) Average Daily Traffic 019900

(30) Year of ADT 1997 (109) Truck ADT 10 %

(19) Bypass, detour length 000 KM

Geometric Data

(48) Length of maximum span 0016.2 M

(49) Structure Length 00017.7 M

(50) Curb or sidewalk: Left 03.2 M Right 03.2M

(51) Bridge Roadway Width Curb to Curb 015.8 M

(52) Deck Width Out to Out 024.7 M

(32) Approach Roadway Width (w/shoulders) 015.8 M

(33) Bridge Median - No median Code 0

(34) Skew 00 DEG (35) Structure Flared ☐

(10) Inventory Route MIN Vert Clear 99.99 M

(47) Inventory Route Total Horiz Clear 15.8 M

(53) Min Vert Clear Over Bridge Rdwy 99.99 M

(54) Min Vert Underclear ref N 00.00 M

(55) Min Lat Underclear RT ref N 00.0 M

(56) Min Lat Underclear LT 00.0 M

Navigation Data

38) Navigation Control - No navigation control on waterway Code 0

111) Pier Protection Code

39) Navigation Vertical Clearance 000.0 M

116) Vert-lift Bridge Nav Min Vert Clear M

40) Navigation Horizontal Clearance 0000.0 M

Classification

(112) NBIS Bridge Length

(104) Highway System

(26) Functional Class - Urban Arterial

(100) Defense Highway

(101) Parallel Structure

(102) Direction of Traffic - 1-way traffic

(103) Temporary Structure

(105) Federal Lands Highways

(110) Designated National Network

(20) Toll - On free road

(21) Maintain - State Highway Agency

(22) Owner - State Highway Agency

(37) Historical Significance undetermined

Condition

(58) Deck

(59) Superstructure

(60) Substructure

(61) Channel & Channel Protection

(62) Culverts

Load Rating and Posting

(31) Design Load - H 20

(63) Operating Rating Method Allowable Stress (AS)

(64) Operating Rating

(65) Inventory Rating Method - Allowable Stress (AS)

(66) Inventory Rating

(70) Bridge Posting

(41) Structure - Open

Appraisal

(67) Structural Evaluation

(68) Deck Geometry

(69) Underclearances, vert. and horiz.

(71) Waterway adequacy

(72) Approach Roadway Alignment

(36) Traffic Safety Features

(113) Scour Critical Bridges

Inspections

(90) Inspection Date ~~[illegible]~~ 03-02-98 (91) Fre

(92) Critical Feature Inspection:

(A) Fracture Critical Detail ☐ 00 MC

(B) Underwater Inspection ☒ 36 MC

(C) Other Special Inspection ☐ 00 MC

(*) Critical Member ☐ 00 MC

(*) Closed Bridge ☐ 00 MC

(*) DamageInspection MC

Loads

	H20	Type 3	Type
Operating	33	61	
Inventory	23	35	

Posting

Status LEGAL Da

2 Axle 3 Axle

Misc.

Bridge Name

☐ Anti-missile fence ☐ Acrow Panel ☐

Accessibility

☐ Liftbucket

☐ Ladder

☒ Boat

☒ Wader

☐ Inspector 50

☐ Rigging

☐ Staging

☐ Traffic Control

☐ RR Flagperson

☐ Police

State Information

FHWA Select List= ☐

AASHTO= 083.0

Identification

431896E12101

131000022

artment District 04

025 (4) Place code 07000

d WATER MUDDY RIVER

HWY COMM AVE

.3 MI E OF KENMORE SQ.

0000.000

vork ☒

e & Subroute

42 DEG 20 MIN 55.46 SEC

71 DEG 05 MIN 35.28 SEC

Code Share %

ture No. #

Structure Type and Material

n: Steel Code 302

Jointless bridge type: Not applicable

r:

Code 000

main unit 001

n spans 0000

pe - Concrete Cast-in-Place Code 1

' Protective System:

urface - Bituminous Code 6

- Preformed Fabric Code 2

ection - Unknown Code 8

Age and Service

1917

ed 1974

- Highway-Ped

y Code 55

04 Under structure 00

fic 019900

1997 (109) Truck ADT 10 %

gth 000 KM

Geometric Data

span 0016.2 M

00017.7 M

Left 03.2 M Right 03.2 M

lth Curb to Curb 015.8 M

Out 024.7 M

Width (w/shoulders) 015.8 M

o median Code 0

DEG (35) Structure Flared ☐

l Vert Clear 99.99 M

al Horiz Clear 15.8 M

Bridge Rdwy 99.99 M

r ref N 00.00 M

RT ref N 00.0 M

LT 00.0 M

Navigation Data

No navigation control on waterway Code 0

Code

Clearance 000.0 M

Min Vert Clear M

l Clearance 0000.0 M

Classification

		Code
(112) NBIS Bridge Length		☒
(104) Highway System		☒
(26) Functional Class -	Urban Arterial	14
(100) Defense Highway		0
(101) Parallel Structure		R
(102) Direction of Traffic -	1-way traffic	1
(103) Temporary Structure		☐
(105) Federal Lands Highways		0
(110) Designated National Network		☐
(20) Toll -	On free road	3
(21) Maintain -	State Highway Agency	01
(22) Owner -	State Highway Agency	01
(37) Historical Significance	undetermined	

Condition

	Code
(58) Deck	8
(59) Superstructure	7
(60) Substructure	7
(61) Channel & Channel Protection	7
(62) Culverts	N

Load Rating and Posting

		Code
(31) Design Load -	H 20	4
(63) Operating Rating Method	Allowable Stress (AS)	2
(64) Operating Rating		53.2
(65) Inventory Rating Method -	Allowable Stress (AS)	2
(66) Inventory Rating		34.6
(70) Bridge Posting		5
(41) Structure -	Open	A

Appraisal

	Code
(67) Structural Evaluation	7
(68) Deck Geometry	4
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	8
(72) Approach Roadway Alignment	8
(36) Traffic Safety Features	1 N N N
(113) Scour Critical Bridges	8

Inspections

(90) Inspection Date 3/2/98 (91) Frequency 24 MO

(92) Critical Feature Inspection: (93) CFI DATE

(A) Fracture Critical Detail	☐	00	MO A)	00/00/00
(B) Underwater Inspection	☒	36	MO B)	12/22/97
(C) Other Special Inspection	☐	00	MO C)	00/00/00
(*) Critical Member	☐	00	MO *)	00/00/00
(*) Closed Bridge	☐	00	MO *)	00/00/00
(*) DamageInspection			MO *)	00/00/00

Loads

	H20	Type 3	Type 3S2	Type HS
Operating	33	61	92	59
Inventory	23	35	54	38

Posting

Status LEGAL Date 12/26/97

2 Axle 3 Axle 5 Axle

Misc.

Bridge Name

☐ Anti-missile fence ☐ Acrow Panel ☐ Integral Bridge

Accessibility

☐ Liftbucket	☐ Rigging	Inspection
☐ Ladder	☐ Staging	Hours: 12
☒ Boat	☐ Traffic Control	
☒ Wader	☐ RR Flagperson	
☐ Inspector 50	☐ Police	

Report Date: June 6, 2000

State Information

BDEPT#=B16176 FHWA Select List= N

Town=Boston

B.I.N=3EV AASHTO= 083.0

Identification

(8) Structure Number 431896E12101

(5) Inventory Route 131000022

(2) State Highway Department District 04

(3) County Code 025 (4) Place code 07000

(6) Features Intersected WATER MUDDY RIVER

(7) Facility Carried HWY COMM AVE

(9) Location .3 MI E OF KENMORE SQ.

(11) Kilometerpoint 0000.000

(12) Base Highway Network Y

(13) LRS Inventory Route & Subroute

(16) Latitude 42 DEG 20 MIN 55.46 SEC

(17) Longitude 71 DEG 05 MIN 35.28 SEC

(98) Border Bridge State Code Share %

(99) Border Bridge Structure No. #

Structure Type and Material

(43) Structure Type Main: Steel Code 302

Stringer/Girder Jointless bridge type: Not applicable

(44) Structure Type Appr:

Other Code .000

(45) Number of spans in main unit 001

(46) Number of approach spans 0000

(107) Deck Structure Type - Concrete Cast-in-Place Code 1

(108) Wearing Surface / Protective System:

A) Type of wearing surface - Bituminous Code 6

B) Type of membrane - Preformed Fabric Code 2

C) Type of deck protection - Unknown Code 8

Age and Service

(27) Year Built 1917

(106) Year Reconstructed 1974

(42) Type of Service: On - Highway-Ped

Under - Waterway Code 55

(28) Lanes: On Structure 04 Under structure 00

(29) Average Daily Traffic 020900

(30) Year of ADT 2000 (109) Truck ADT 13 %

(19) Bypass, detour length 000 KM

Geometric Data

(48) Length of maximum span 0016.2 M

(49) Structure Length 00017.7 M

(50) Curb or sidewalk: Left 03.2 M Right 03.2 M

(51) Bridge Roadway Width Curb to Curb 015.8 M

(52) Deck Width Out to Out 024.7 M

(32) Approach Roadway Width (w/shoulders) 015.8 M

(33) Bridge Median - No median Code 0

(34) Skew 00 DEG (35) Structure Flared N

(10) Inventory Route MIN Vert Clear 99.99 M

(47) Inventory Route Total Horiz Clear 15.8 M

(53) Min Vert Clear Over Bridge Rdwy 99.99 M

(54) Min Vert Underclear ref N 00.00 M

(55) Min Lat Underclear RT ref N 00.0 M

(56) Min Lat Underclear LT 00.0 M

Navigation Data

(38) Navigation Control - No navigation control on waterway Code 0

(111) Pier Protection Code

(39) Navigation Vertical Clearance 000.0 M

(116) Vert-lift Bridge Nav Min Vert Clear M

(40) Navigation Horizontal Clearance 0000.0 M

Classification

(112) NBIS Bridge Length

(104) Highway System

(26) Functional Class - Urban Arterial

(100) Defense Highway

(101) Parallel Structure

(102) Direction of Traffic - 1-way tr

(103) Temporary Structure

(105) Federal Lands Highways

(110) Designated National Network

(20) Toll - On free road

(21) Maintain - State Highway Agency

(22) Owner - State Highway Agency

(37) Historical Significance undetermine

Condition

(58) Deck

(59) Superstructure

(60) Substructure

(61) Channel & Channel Protection

(62) Culverts

Load Rating and Posting

(31) Design Load - H 20

(63) Operating Rating Method Allowable Stress (A

(64) Operating Rating

(65) Inventory Rating Method - Allowable Stress (A

(66) Inventory Rating

(70) Bridge Posting

(41) Structure - Open

Appraisal

(67) Structural Evaluation

(68) Deck Geometry

(69) Underclearances, vert. and horiz.

(71) Waterway adequacy

(72) Approach Roadway Alignment

(36) Traffic Safety Features

(113) Scour Critical Bridges

Inspections

(90) Inspection Date 03/14/2000 (91)

(92) Critical Feature Inspection:

(A) Fracture Critical Detail N 00

(B) Underwater Inspection Y 36

(C) Other Special Inspection N 00

(*) Other Inspection N 00

(*) Closed Bridge N 00

(*) Damage Inspection

Loads

Date 00/00/00	H20	Type 3	Ty
Operating	33	61	
Inventory	23	35	

Posting

Status LEGAL

2 Axle 3 Axle

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel

Accessibility

N Liftbucket N Rigging

N Ladder N Staging

Y Boat N Traffic Contro

N Wader N RR Flagperson

N Inspector 50 N Police

MASSACHUSETTS HIGHWAY DEPARTMENT

UNDERWATER OPERATIONS TEAM

DIVERS ACTIVITY REPORT

bridge dept. no. B-16-18

	5-facility carried BEACON ST.	6-features intersected MUDDY RIVER	93b-date inspected 12/22/97
tructure no. 896 010 100	foundation type	dive master R. BONICA	
el	access to bridge EMBANKMENT	team members J. FITZGERALD, J. DONAHUE, B. SULLIVAN	
ions SCAT'D BOULDERS	water conditions HIGH BACTERIA POLLUTION	depth 2 m +/-	visibility 1 m +/-
		current NIL	

60 (Underwater) ucture	7
tments	
gs	7
astwall	7
nting	7
tings	IA
s	X
ur	7
ermining	NO
lement	8
	NA
	NA
s or Bents	
n	7
ting	7
mn	NA
ing	IA
	X
r	8
ermining	NO
ement	8
	NA
Bents	
crete Piles	NA
er Piles	NA
onal Bracing	NA
ontal Bracing	NA
ners	NA
	NA

ermining rated as YES or NO

4. Fender System

a.) Piles	NA
b.) Diagonal Bracing	NA
c.) Horizontal Bracing	NA
d.) Wales	NA
e.) Fasteners	NA
f.) Ladders	NA
g.)	NA
h.)	NA

Item 61 (Underwater) 7

Channel and Channel Protection

1. Debris	6
2. Aggradation	7
3. Utilities	X
4. Rip Rap	7
5.	NA
6.	NA

Item 113 **Scour Critical Bridges**

Scour

a.) Footing Exposed	N
b.) Undermining	N

Scour Countermeasures

a.) Sheeting	N
b.) Rip Rap	Y
c.) Other	N

Y=YES N=NO

Submitted by:

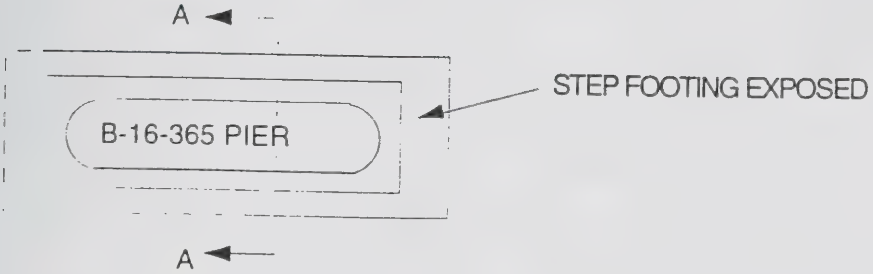
OWN NA=NOT APPLICABLE IA=INACCESSIBLE

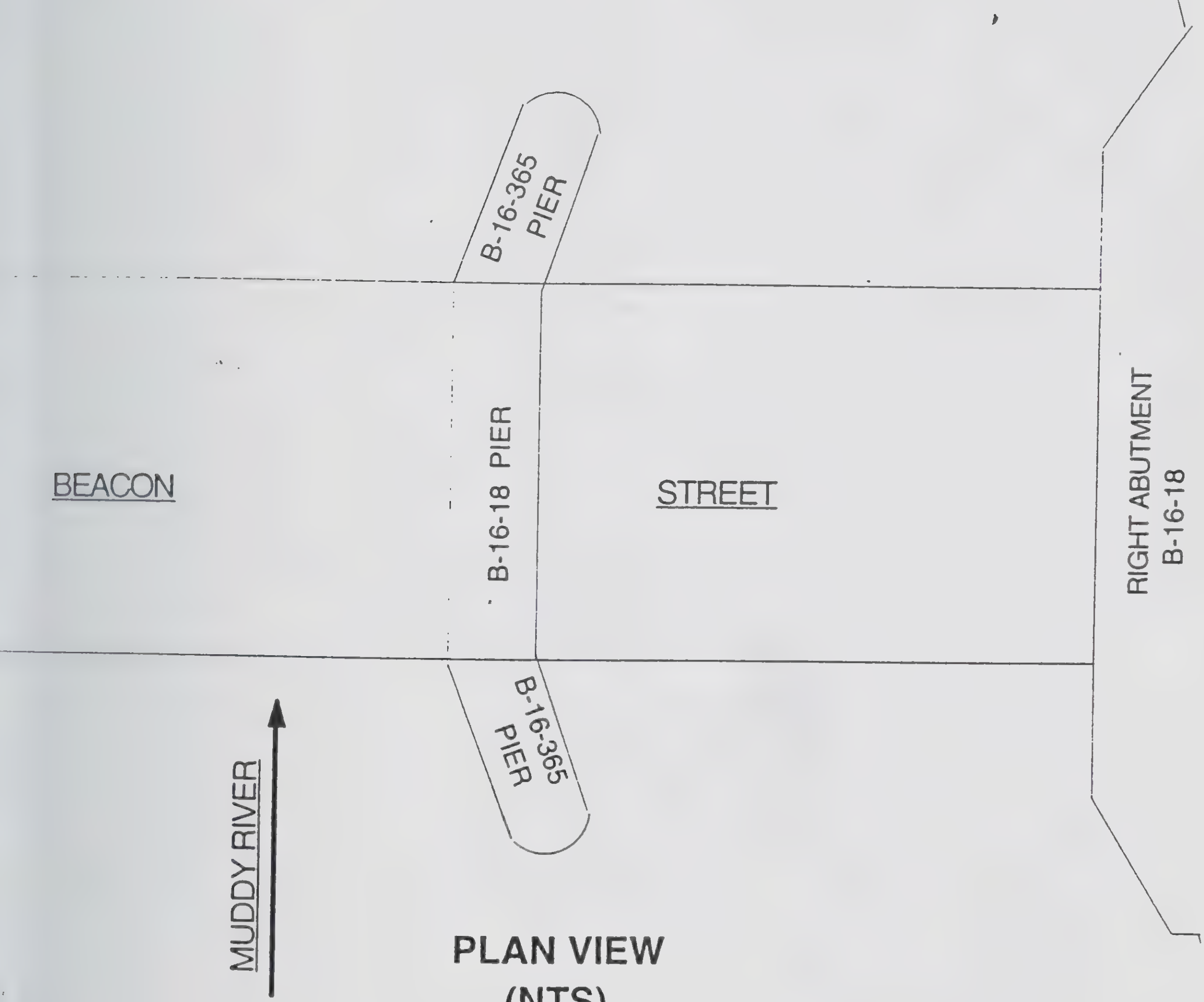
FILE

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECT
A BOSTON	397	B-16-18	012 896 010 100	Decen

REMARKS & PHOTOS

Two span structure with granite abutments and pier. See sketch.
No footings exposed, no undermining.
Rip rap is in good condition.
Mortar joints between blocks are generally tight, maximum penetration is 0.08 m.





PLAN VIEW
(NTS)

B-16-365
PIER SECTION 'A-A'
(NTS)

SCOUR MONITORING CHART

	11/26/91	12/10/94	12/22/97
UPSTREAM END			
LEFT ABUTMENT	1.4 m	1.4 m	1.3 m
C/L LEFT SPAN	1.9 m	1.9 m	1.7 m
L. SIDE - PIER	1.3 m	1.7 m	1.4 m
C/L PIER BR NO B-16-365	2.4 m	2.4 m	- - -
R. SIDE - PIER	2.0 m	2.0 m	2.1 m
C/L RIGHT SPAN	2.0 m	1.8 m	1.7 m
RIGHT ABUTMENT	1.3 m	1.1 m	1.1 m
US END - RT. ABUT.	2.0 m	1.9 m	1.8 m
DOWNSTREAM END			
DS END - LEFT ABUT.	1.4 m	1.3 m	1.3 m
LEFT ABUTMENT	1.4 m	1.4 m	1.3 m
C/L LEFT SPAN	1.6 m	- - -	1.7 m
L. SIDE - PIER	1.7 m	1.7 m	1.4 m
C/L PIER - B-16-355	2.0 m	2.0 m	- - -
R. SIDE - PIER	2.1 m	2.1 m	1.8 m
C/L RIGHT SPAN	2.0 m	- - -	1.7 m
RIGHT ABUTMENT	1.5 m	1.7 m	1.3 m
DS END - RT. ABUT.	1.6 m	1.5 m	1.4 m
Y	0.24 m	0.27 m	0.15 m
CORRECTION FACTOR	- - -	-0.03 m	-0.09 m

NOTES:

1. *WATERLINE TO TOP STEP OF FOOTING OF SMALL DOWNSTREAM PIER (B*
= Y = 0.24 m (11/26/91).
2. *ALL MEASUREMENTS ARE IN METRIC.*

tremely high'

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rom
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and
ory
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mental group that commissioned the tests.

"Even one drop of water as contaminated as this is dangerous to people with low immune systems, children or HIV-positive people," said Irene Gillis, chairwoman of Restore Olmsted's Waterway. Speaking at a conference on the Muddy River held at Harvard's School of Public Health yesterday, she and other activists warned residents not to swim in the water, eat fish caught there or even touch the water

MUDDY, Page B4

11/17/96

show high pollution

■ MUDDY
Continued from Page B1

"Even if your dog runs through this water and you pet him, he can bring waterborne disease into your home," Gillis said.

Restore Olmsted's Waterway is a citizens' group dedicated to cleaning up the Muddy River, the 3½-mile waterway that snakes through the Emerald Necklace of parks and green space designed 100 years ago by Frederick Law Olmsted.

The group's decade-long fight over the Muddy took on renewed importance in the last few weeks when the reed-choked and sewage-contaminated river flooded into residential basements and subway stations. The river has flooded twice in the last two months and polluted water from the Muddy flows into the Charles River.

Former Gov. Michael S. Dukakis, in an interview at the conference, faulted his successor in the State House for not taking leadership in stopping pollution of a riverway that passes close to the homes of thousands of Boston and Brookline residents.

"This is a state responsibility, and you know who should be here? The guy in the governor's office. It's one thing to say you care about the environment, and it's another to put your money where your mouth is," Dukakis said of Gov. William F. Weld.

"If he had taken a dive in [the Muddy River] at Charlesgate, he'd never have come up," Dukakis said in a mocking reference to Weld's much-hyped splash into the Charles River after signing a rivers protection bill.

But Weld's spokesman, Bob Bliss, expressed disbelief that Dukakis would wag a finger at Weld.

"I'm surprised that Gov. Dukakis, who was a few days late and a couple of hundred million dollars short in cleaning up Boston Harbor, would be criticizing anyone on an environmental cleanup," Bliss said.

Rick Lombardi, a spokesman for the state Executive Office of Environmental Affairs, insisted that Weld "has taken the initiative" to clean up the river. "We have appointed a mediator to work with a multitude of groups, the city of Boston, Massachusetts Water Resources Authority and the Army Corps of Engineers to try to bring a plan into action," he said.

Samples taken last month from sediment at the base of the Netherlands Road bridge in Brookline, near the town's water and sewer works, found 63,000 colonies per gram of clostridium perfringens bacteria, which can cause gas gangrene and gastrointestinal disorders, according to Fred Youngs, director of the Citizens' Environmental Laboratory in Cambridge. That is 21 times higher than the levels recorded at sewage outfalls in the harbor, he said.

The clostridium signals the presence of other pathogens or disease-bearing organisms such as hepatitis A, staphylococcus and salmonella, Youngs said.

The tests also found elevated levels of the waterborne pathogen enterococcus. In one spot, the bacteria was measured at 5 ½ times the level permitted by Environmental Protection Agency guidelines.

Youngs noted that the levels of fecal coliform – which indicates the presence of raw human sewage in water – measured in the Muddy in a 1992 study by the Army Corps of Engineers was in some cases between 1,000 and 2,500 times higher than EPA guidelines, outstripping the levels in the Charles River that caused alarm a few months ago.

Documents obtained recently indicate that in 1992, when the dangerously elevated levels of fecal coliform were found in the Muddy River, federal officials rejected as too costly plans to improve flood control along the river.

But damage and cleanup costs for the MBTA from last month's flooding – which forced the closing of the Kenmore Square station for several days and disrupted service for 200,000 riders – is expected to run between $15 and $20 million, calling into question the Army Corps of Engineers' recommendation rejecting flood control four years ago.

Cathleen Douglas Stone, environmental services director for the city of Boston, said Mayor Thomas M. Menino has a commitment to preserving open space in the city, and is studying ways to limit pollution of the Muddy, from reducing or eliminating discharge into the river to keeping Boston streets cleaner so garbage won't blow into the river.

Dr. Alan Balsam, director of Brookline's Public Health Department, warned that people should be cautious about recreational activity near the Muddy.

But Balsam added that Brookline aims within the next year and a half to fix all 39 improper sewer hookups or discharges that are polluting the Muddy with sewage.

PAGE 5 OF 5

Element Data Collection Form

Month	Day	Year
12	22	97

idge Number B-16-18

BIN 397

dge Key Number 012 896 010 100

Town BOSTON

District 4

Inspectors		
BONICA	FITZGERALD, DONAHUE, SULLIVAN	U/W OPNS
Leader	*Member*	*Agency/Consultant/Dept. Name*

	Units	Environ.	Total Quantity	Condition States (Quantity or Percent) *					Q or P *
				1	2	3	4	5	
T	M	2	43.2	43.2					Q
ALL	M	2	21.6	21.6					Q

etween Quantity and Percent for different Elements.

MASSACHUSETTS HIGHWAY DEPARTMENT

STRUCTURES INSPECTION FIELD REPORT

ROUTINE INSPECTION

PAGE 1 OF 8

BR. DEPT. NO.
B-16-018

	8-STRUCTURES NO. 012-896-010-100	11-KILOM PT 0001.23	41-STATUS OPEN	90-ROUTINE INSP DATE 03/03/98
	MEMORIAL NAME/LOCAL NAME	27-YR BUILT 1900	106-YR REBUILT 1982	YR REHAB'D (NON 106)
ED	26-FUNCTIONAL CLASS. URBAN ARTERIAL	DIST. BRIDGE INSPECTION ENGINEER		
BEAMS	22-OWNER STATE	21-MAINTAINER STATE	TEAM LEADER	
AST PANELS	WEATHER CLDY.	TEMP[a] 45	TEMP[c]	TEAM MEMBERS J.WELCH

		DEF
	8	
	7	M/P
	8	
	N	
	7	
	N	
	8	
	7	M/P
	7	M/P
	N	
	N	
s	N	
	6	M/P
	7	

N/E	S/W
177	177

		DEF
	7	
nt	7	
a	7	

(Y/N) N

		DEF
	N	
	N	
	N	

ITEM 59
SUPERSTRUCTURE 8

			DEF
1. Stringers		N	
2. Floorbeams		N	
3. Floor System Bracing		N	
4. Girders or Beams		8	
5. Trusses - General		N	
a. Upper Chords	N		
b. Lower Chords	N		
c. Web Members	N		
d. Lateral Bracings	N		
e. Sway Bracings	N		
f. Portals	N		
g. End Posts	N		
6. Pin & Hangers		N	
7. Conn Plt's, Gussets & Angles		N	
8. Cover Plates		N	
9. Bearing Devices		H	
10. Diaphragms/Cross Frames		N	
11. Rivets & Bolts		N	
12. Welds		N	
13. Member Alignment		8	
14. Paint/ Coating		N	
15.			
Year Painted:		N	

COLLISION DAMAGE: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

LOAD DEFLECTION: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

LOAD VIBRATION: *Please explain*
None (X) Minor ( ) Moderate ( ) Severe ( )

Any Fracture Critical Member : (Y/N) N

Any Cracks : (Y/N) N

ITEM 60
SUBSTRUCTURE 8

			DEF
1. Abutments		7	▇
a. Wingwalls	8		
b. Backwalls	7		M/P
c. Breastwalls	7		M/P
d. Bridge Seats	H		
e. Pedestals	N		
f. Footings	H		
g. Piles	H		
2. Piers or Bents		8	▇
a. Caps	8		
b. Pedestals	N		
c. Columns	N		
d. Webs	8		
e. Footings	H		
f. Piles	H		
3. Pile Bents		N	▇
a. Piles	N		
b. Diagonal Bracing	N		
c. Horizontal Bracing	N		
d. Fasteners	N		
4. Settlement		7	
5. Pointing		7	
6. Erosion		7	
7. Debris on Seats		H	
8. Slope Paving		N	
9.			
10.			

COLLISION DAMAGE:
None (X) Minor ( ) Moderate ( ) Severe ( )

UNDERMINING (Y/N) If YES please explain N

SCOUR:
None (X) Minor ( ) Moderate ( ) Severe ( )

ITEM 60 FROM U/W INSP. 7

93b-U/W INSP DATE: 12/10/94

N=NOT APPLICABLE H=HIDDEN/INACCESSIBLE R=REMOVED

CITY/TOWN	B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	90- INSPE
BOSTON	397	B-16-018	012-896-010-100	

TEM 61 *CHANNEL & CHANNEL PROTECTION* 7

		DEF
I. Channel Scour	7	
2. Embankment Erosion	7	
3. Debris	7	
4. Vegetation	7	
5. Utilities	N	
5 Hydraulic Adequacy	7	
7. Spur Dikes & Jetties	N	
3. Rip Rap & Slope Protection	7	
9. Fender System	N	
10. Effectiveness/Alignment	7	

STREAM FLOW VELOCITY:

Tidal ( ) High ( ) Moderate ( ) Low (X)

ITEM 61 FROM U/W INSP. 7

93b-U/W INSP. DATE 12/10/94

ITEM 36 *TRAFFIC SAFETY*

	36	COND	DEF
1. Bridge Railing	1	7	
2. Transitions	0	6	M/P
3. Approach Guardrail	N		
4. Approach Guardrail Ends	N		

WEIGHT POSTING: *Not Applicable* ☒

	H	3	3S2	SINGLE
Actual Posting				
Recommended Posting from Rating Book				

Waived Date: EJDMT Date:

	At bridge N/E	At bridge S/W	Advance N/E	Advance S/W
Signs In Place (Y=Yes N=No)				
Legibility/ Visibility				

CLEARANCE POSTING: *Not Applicable* ☒

	ft	in
Actual Field Measurement		
Posted Clearance		

	At bridge N/E	At bridge S/W	Advance N/E	Advance S/W
Signs In Place (Y=Yes N=No)				
Legibility/ Visibility				

ACCESSI

- Lift Bucket
- Ladder
- boat
- Wader
- Inspector 50
- Rigging
- Staging
- Traffic Contr
- U/W Inspecti
- RR Flagger
- Police
- Other:

TOTAL H

PLANS:

(V.C.R.):

TAPE #:

List of Field T

ATING:

Rating Report (Y/N): Y

Request for Rating or Rerating (Y/N): N

If YES please give priority: HIGH ( ) MEDIUM ( ) LOW ( )

Date: 07/97

Reason:

CONDITION RATING GUIDE

(For Items 58, 59, 60 and 61)

	CODE	CONDITION	DEFECTS
	N	NOT APPLICABLE	
G	9	EXCELLENT	Excellent condition.
G	8	VERY GOOD	No problem noted.
G	7	GOOD	Some minor problems.
F	6	SATISFACTORY	Structural elements show some minor deterioration.
F	5	FAIR	All primary structural elements are sound but may have minor section loss, cracking, spalling or scour.
P	4	POOR	Advance section loss, deterioration, spalling or scour.
P	3	SERIOUS	Loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are in steel or shear cracks in concrete may be present.
C	2	CRITICAL	Advance deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action
C	1	"IMMINENT" FAILURE	Major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement Bridge is closed to traffic but corrective action may put it back in light service.
	0	FAILED	Out of service - beyond corrective action.

DEFICIENCY REPORTING GUIDE

DEFICIENCY: A defect in a structure that requires corrective action.

CATEGORIES OF DEFICIENCIES:

M= Minor Deficiency -(Examples include but are not limited to: Spalled concrete, minor pot holes, minor corrosion to steel, minor scouring, clogged
guardrail, etc.)

S= Severe/Major Deficiency - (Examples include but are not limited to: Large spalls, wide cracks, moderate to major deterioration in concrete,
considerable scouring or undermining, moderate to extensive corrosion to steel, etc.)

C= Critical Deficiency - A deficiency in a structural component or element of a bridge that poses an extreme hazard or unsafe
(Follow-Up Critical Deficiency Report must be submitted separately)

URGENCY OF REPAIR:

I= Immediate, [Inspector(s) stay at the bridge until District Maintenance crew or the responsible Agency crew (if not a State bridge) show up and corrective

A= As soon as possible, [Action will be taken by District Maintenance Engineer or the Responsible Agency (if not a State owned bridge) upon receipt of

P= Prioritize, [Shall be prioritized by District Maintenance Engineer or the Responsible Agency (if not a State owned bridge) and repairs be made when
available].

PAGE 3 OF 8

B.I.N.	BR. DEPT. NO.	8-STRUCTURE NO.	INSPECTION DATE
397	B-16-018	012-896-010-100	03/03/98

REMARKS & PHOTOS

OT REQUIRED

FETY FEATURES
ETE ENCASED BALUSTRADE RAIL
IEAST & NORTHWEST HAS IRON PIPE RAIL WITH VOID BETWEEN END POST
OLLISION DAMAGE TO NORTHWEST RAIL.SOUTHEAST TIES INTO END POST
WEST HAS VOID BETWEEN RAIL AND END POST.
OT EXIST
OT EXIST

TRANSVERSE CRACKING OVER WEST ABUTMENT AND PARTIAL LIGHT
E CRACKING OVER EAST ABUTMENT.

ERTICAL CRACK WITH EFFLORESCENCE AT NORTH FACE.

ON DAMAGE TO IRON PIPE RAIL AT NORTHWEST CORNER.

UTILITY EXHIBITS HEAVY RUST

TURE
L CONDITION REMAINS VERY GOOD WITH ONLY MINOR PROBLEMS NOTED
IGHT WATER STAINS AT EAST END; ALSO NOTED AT RANDOM LOCATIONS
T SMALL PIECES OF FILLER HANGING.

JRE
ACKWALLS HAVE LIGHT WATER STAINS.

#1 BELOW BEAMS #1 THROUGH #3 RUST STAINS AND BELOW BEAMS #8
LIGHT HORIZONTAL CRACK WITH EFFLORESCENCE AND RUST STAINS.

AP WEST FACE BELOW BEAMS #12 & #13 LIGHT HORIZONTAL CRACK WITH
NCE.

4

A

UNDERWATER OPERATIONS TEAM
DIVERS ACTIVITY REPORT

city/town: BOSTON
7-facility carried: BEACON ST
6-features intersected: MUDDY RIVER
8-structure no.: 012-896-010-100
Foundation type:
dive master: J.DONAHUE
level of inspection: II
access to bridge: EMBANKMENT
team members: J. FITZGERALD
bottom conditions: MUD, SILT & SCATTERED BOULDERS
water conditions: VERY DIRTY
depth: 7'±
visib: 2

Item 60 (Underwater) Substructure: 7

1. Abutments

a.) Wings	7
b.) Breastwall	7
c.) Pointing	7
d.) Footings	IA
e.) Piles	X
f.) Scour	8
g.) Undermining	NO
h.) Settlement	8

2. Piers or Bents

a.) Stem	7
b.) Pointing	7
c.) Column	NA
d.) Footing	IA
e.) Piles	X
f.) Scour	8
g.) Undermining	NO
h.) Settlement	8

3. Pile Bents

a.) Concrete Piles	NA
b.) Timber Piles	NA
c.) Diagonal Bracing	NA
d.) Horizontal Bracing	NA
e.) Fasteners	NA

Note: Undermining rated as YES or NO

4. Fender System

a.) Piles	N
b.) Diagonal Bracing	NA
c.) Horizontal Bracing	NA
d.) Wales	NA
e.) Fasteners	NA
f.) Ladders	NA

Item 61 (Underwater) Channel and Channel Protectio

1. Debris	6
2. Aggradation	7
3. Utilities	X
4. Rip Rap	7

Item 113
Scour Critical Bridges

Scour

a) Footing exposed	N
b) Undermining	N

Scour Countermeasures

a) Sheeting	N
b) Rip rap	Y
c) Other	N

Y=Y

Submitted by

X=UNKNOWN NA=NOT APPLICABLE IA=INACC

BI 3-15-93
D-4

4 OF

Remarks, Photos and Sketches

N	bridge dept. no. B-16-18	8-structure no. 012-896-010-100	93b-date inspected 12-10-94

SPAN STRUCTURE WITH GRANITE ABUTMENTS & PIER.

FOOTINGS EXPOSED. NO UNDERMINING.

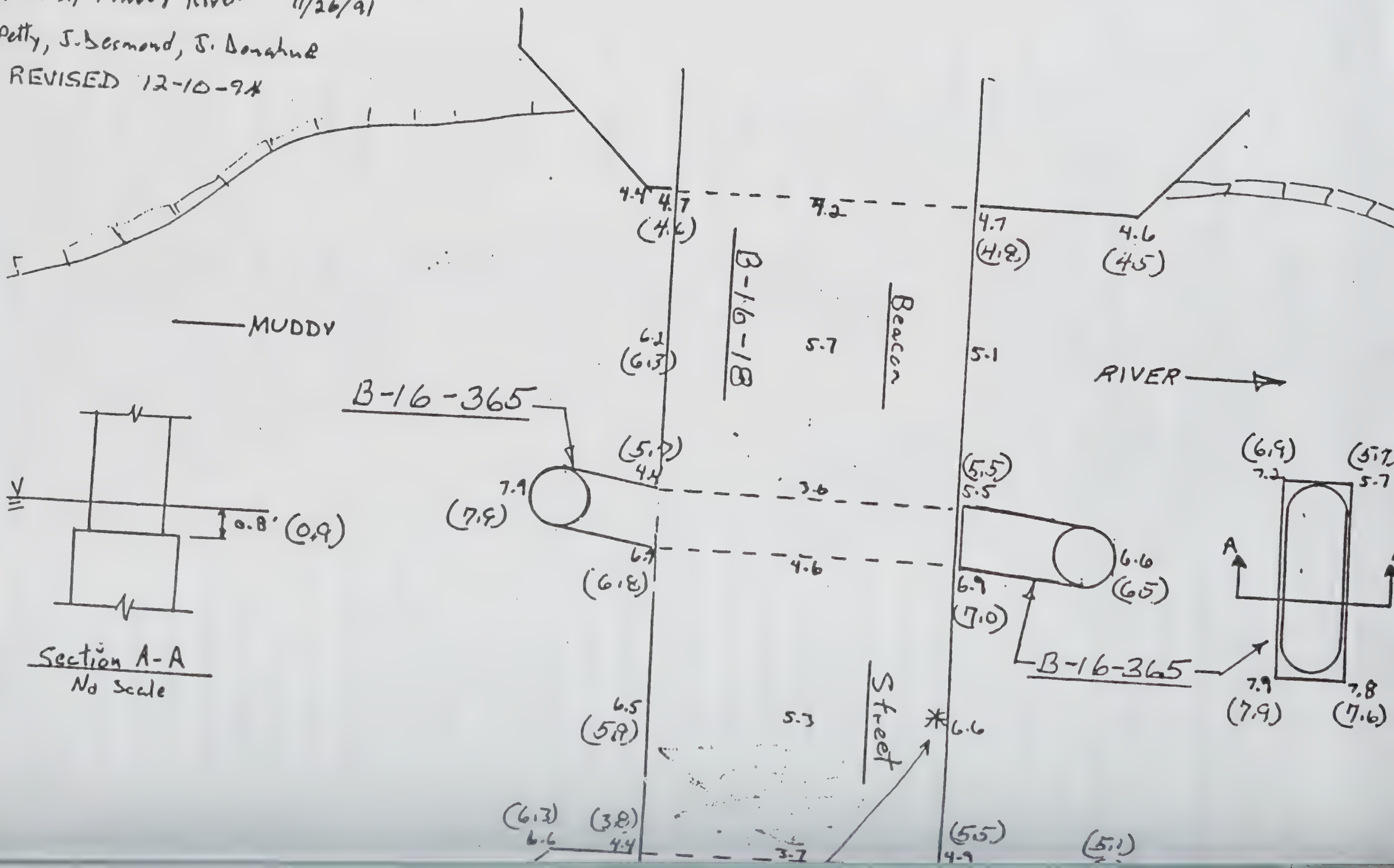
RAP IS IN GOOD CONDITION.

TAR JOINTS BETWEEN GRANITE BLOCKS ARE GENERALLY TIGHT.

RANDOM PENETRATION INTO JOINT OF 0.5'.

5 OF 8

Boston B-16-18 012-896-010-100
Beacon St/ Muddy River 11/26/91
D. Petty, J. Desmond, J. Donahue
REVISED 12-10-91



State Information

FHWA Select List= ☐

AASHTO= 096.0

Identification

012896010100

181000000

ient District 04

(4) Place code 07000

WATER MUDDY RIVER

HWY BEACON ST

.2 MI W OF JCT BEACON&2A

0001.223

☒

Subroute

4 2 DEG 2 0 MIN;9.76 SEC

7 1 DEG 0 5 MIN14.99 SEC

le Share %

. No. #

ucture Type and Material

Concrete Code 105

Multiple

Code 000

n unit 002

ans 0000

Concrete Precast Panels Code 2

tective System:

e - Bituminous Code 6

Preformed Fabric Code 2

n - Unknown Code 8

Age and Service

1900

1982

Highway-Ped

Code 55

03 Under structure 00

019900

997 (109) Truck ADT 06 %

002 KM

Geometric Data

0008.2 M

00016.5 M

Left 03.2 M Right 03.2 M

urb to Curb 014.1 M

021.6 M

h (w/shoulders) 014.0 M

dian Code 0

(35) Structure Flared ☐

t Clear 05.16 M

riz Clear 14.1 M

e Rdwy 04.93 M

N 00.00 M

N 00.0 M

00.0 M

Navigation Data

navigation control on waterway Code 0

Code

ance 000.0 M

Vert Clear M

arance 0000.0 M

Classification

		Code
(112) NBIS Bridge Length		☒
(104) Highway System		☐
(26) Functional Class -	Urban Arterial	14
(100) Defense Highway		0
(101) Parallel Structure		N
(102) Direction of Traffic -	1-way traffic	1
(103) Temporary Structure		☐
(105) Federal Lands Highways		0
(110) Designated National Network		☐
(20) Toll -	On free road	3
(21) Maintain -	State Highway Agency	01
(22) Owner -	State Highway Agency	01
(37) Historical Significance	not eligible (in historic area)	A

Condition

	Code
(58) Deck	8
(59) Superstructure	8
(60) Substructure	8
(61) Channel & Channel Protection	7
(62) Culverts	N

Load Rating and Posting

		Code
(31) Design Load -	HS 20+Mod	6
(63) Operating Rating Method	Allowable Stress (AS)	2
(64) Operating Rating		34.4
(65) Inventory Rating Method -	Allowable Stress (AS)	2
(66) Inventory Rating		43.7
(70) Bridge Posting		5
(41) Structure -	Open	A

Appraisal

	Code
(67) Structural Evaluation	8
(68) Deck Geometry	5
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	5
(72) Approach Roadway Alignment	6
(36) Traffic Safety Features	1 0 N N
(113) Scour Critical Bridges	6

Inspections

(90) Inspection Date ~~3/1/96~~ 3-3-98 (91) Frequency 24 MO

(92) Critical Feature Inspection:

				(93) CFI DATE
(A) Fracture Critical Detail	☐	00	MO A)	00/00/00
(B) Underwater Inspection	☒	36	MO B)	12/1/94
(C) Other Special Inspection	☐	00	MO C)	00/00/00
(*) Critical Member	☐	00	MO *)	00/00/00
(*) Closed Bridge	☐	00	MO *)	00/00/00
(*) DamageInspection			MO *)	00/00/00

Loads

	H20	Type 3	Type 3S2	Type HS
Operating	21	41	63	38
Inventory	27	38	58	48

Posting

Status LEGAL Date 10/17/97

2 Axle 3 Axle 5 Axle

Misc.

Bridge Name

☐ Anti-missile fence ☐ Arrow Panel ☐ Integral Bridge

Accessibility

☐ Liftbucket

☐ Ladder

☒ Boat

☒ Wader

☐ Inspector 50

☐ Rigging

☐ Staging

☐ Traffic Control

☐ RR Flagperson

☐ Police

Inspection Hours: 12

Report Date: March 2, 1998

A

State Information

BDEPT#= B16018 FHWA Select List= ☐

Town= Boston

B.I.N= 397 AASHTO= 096.0

Identification

(8) Structure Number	012896010100
(5) Inventory Route	181000000
(2) State Highway Department District	04
(3) County Code 025 (4) Place code	07000
(6) Features Intersected	WATER MUDDY RIVER
(7) Facility Carried	HWY BEACON ST
(9) Location	.2 MI W OF JCT BEACON&2A
(11) Kilometerpoint	0001.223
(12) Base Highway Network	☒
(13) LRS Inventory Route & Subroute	
(16) Latitude	42 DEG 20 MIN19.76 SEC
(17) Longitude	71 DEG 05 MIN14.99 SEC
(98) Border Bridge State Code	Share %
(99) Border Bridge Structure No. #	

Structure Type and Material

(43) Structure Type Main: Concrete Code .105

Box Beam or Girders - Multiple Not applicable

(44) Structure Type Appr:

Other Code 000

(45) Number of spans in main unit 002

(46) Number of approach spans 0000

(107) Deck Structure Type - Concrete Precast Panels Code 2

(108) Wearing Surface / Protective System:

A) Type of wearing surface - Bituminous Code 6

B) Type of membrane - Preformed Fabric Code 2

C) Type of deck protection - Unknown Code 8

Age and Service

(27) Year Built 1900

(106) Year Reconstructed 1982

(42) Type of Service: On - Highway-Ped

Under - Waterway Code 55

(28) Lanes: On Structure 03 Under structure 00

(29) Average Daily Traffic 019900

(30) Year of ADT 1997 (109) Truck ADT 06 %

(19) Bypass, detour length 002 KM

Geometric Data

(48) Length of maximum span 0008.2 M

(49) Structure Length 00016.5 M

(50) Curb or sidewalk: Left 03.2 M Right 03.2 M

(51) Bridge Roadway Width Curb to Curb 014.1 M

(52) Deck Width Out to Out 021.6 M

(32) Approach Roadway Width (w/shoulders) 014.0 M

(33) Bridge Median - No median Code 0

(34) Skew 00 DEG (35) Structure Flared ☐

(10) Inventory Route MIN Vert Clear 05.16 M

(47) Inventory Route Total Horiz Clear 14.1 M

(53) Min Vert Clear Over Bridge Rdwy 04.93 M

(54) Min Vert Underclear ref N 00.00 M

(55) Min Lat Underclear RT ref N 00.0 M

(56) Min Lat Underclear LT 00.0 M

Navigation Data

(38) Navigation Control - No navigation control on waterway Code 0

(111) Pier Protection Code

(39) Navigation Vertical Clearance 000.0 M

(116) Vert-lift Bridge Nav Min Vert Clear M

(40) Navigation Horizontal Clearance 0000.0 M

Classification

(112) NBIS Bridge Length

(104) Highway System

(26) Functional Class - Urban Arteri

(100) Defense Highway

(101) Parallel Structure

(102) Direction of Traffic - 1-way

(103) Temporary Structure

(105) Federal Lands Highways

(110) Designated National Network

(20) Toll - On free road

(21) Maintain - State Highway Agency

(22) Owner - State Highway Agency

(37) Historical Significance not eligibl

Condition

(58) Deck

(59) Superstructure

(60) Substructure

(61) Channel & Channel Protection

(62) Culverts

Load Rating and Post

(31) Design Load - HS 20+Mod

(63) Operating Rating Method Allowable Stress

(64) Operating Rating

(65) Inventory Rating Method - Allowable Stress

(66) Inventory Rating

(70) Bridge Posting

(41) Structure - Open

Appraisal

(67) Structural Evaluation

(68) Deck Geometry

(69) Underclearances, vert. and horiz.

(71) Waterway adequacy

(72) Approach Roadway Alignment

(36) Traffic Safety Features

(113) Scour Critical Bridges

Inspections

(90) Inspection Date 3/3/98 (

(92) Critical Feature Inspection:

(A) Fracture Critical Detail ☐ 0

(B) Underwater Inspection ☒ 3

(C) Other Special Inspection ☐ 0

(*) Critical Member ☐ 0

(*) Closed Bridge ☐ 0

(*) DamageInspection

Loads

	H20	Type 3
Operating	21	41
Inventory	27	38

Posting

Status LEGAL

2 Axle 3 Axle

Misc.

Bridge Name

☐ Anti-missile fence ☐ Acrow Panel

Accessibility

☐ Liftbucket

☐ Ladder

☒ Boat

☒ Wader

☐ Inspector 50

☐ Rigging

☐ Staging

☐ Traffic Cont

☐ RR Flagpers

☐ Police

State Information

FHWA Select List= N

AASHTO= 028.0

Identification

BRI896008000

ıent District 04

; (4) Place code 07000

WATER MUDDY RIVER

US 1 JAMAICAWAY

0000.000

N

Subroute

00 DEG 00 MIN 00.00 SEC

00 DEG 00 MIN 00.00 SEC

de Share %

No. #

ructure Type and Material

Code ???

Jointless bridge type:

Code ???

in unit 000

ans 0000

Code ?

otective System:

ce - Code ?

Code ?

on - Code ?

Age and Service

1850

1900

Code

00 Under structure 00

000000

2000 (109) Truck ADT 00 %

000 KM

Geometric Data

in 0000.0 M

00004.6 M

Left 00.0 M Right 00.0 M

Curb to Curb 000.0 M

000.0 M

dth (w/shoulders) 000.0 M

Code ?

(35) Structure Flared N

rt Clear 00.00 M

oriz Clear 00.0 M

ge Rdwy 00.00 M

N 00.00 M

ef N 00.0 M

00.0 M

Navigation Data

Code ?

Code ?

rance 000.0 M

n Vert Clear M

learance 0000.0 M

Classification

Classification		Code
(112) NBIS Bridge Length		N
(104) Highway System		N
(26) Functional Class -		
(100) Defense Highway		1
(101) Parallel Structure		?
(102) Direction of Traffic -		?
(103) Temporary Structure		N
(105) Federal Lands Highways		0
(110) Designated National Network		N
(20) Toll -		
(21) Maintain -		
(22) Owner -		
(37) Historical Significance	undetermined	

Condition

Condition	Code
(58) Deck	?
(59) Superstructure	?
(60) Substructure	?
(61) Channel & Channel Protection	?
(62) Culverts	?

Load Rating and Posting

Load Rating and Posting		Code
(31) Design Load -		?
(63) Operating Rating Method	Allowable Stress (AS)	2
(64) Operating Rating		00.0
(65) Inventory Rating Method -	Allowable Stress (AS)	2
(66) Inventory Rating		00.0
(70) Bridge Posting		0
(41) Structure -		

Appraisal

Appraisal	Code
(67) Structural Evaluation	N
(68) Deck Geometry	N
(69) Underclearances, vert. and horiz.	N
(71) Waterway adequacy	
(72) Approach Roadway Alignment	
(36) Traffic Safety Features	
(113) Scour Critical Bridges	6

Inspections

(90) Inspection Date 00/00/00 (91) Frequency 24 MO

(92) Critical Feature Inspection:				(93) CFI DATE
(A) Fracture Critical Detail	N	00	MO A)	00/00/00
(B) Underwater Inspection	N	00	MO B)	00/00/00
(C) Other Special Inspection	N	00	MO C)	00/00/00
(*) Other Inspection	N	00	MO *)	00/00/00
(*) Closed Bridge	N	00	MO *)	00/00/00
(*) Damage Inspection			MO *)	00/00/00

Loads

Date 00/00/00	H20	Type 3	Type 3S2	Type HS
Operating	00	00	00	00
Inventory	00	00	00	00

Posting

Status Date 00/00/00

2 Axle 3 Axle 5 Axle

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel N Jointless Bridge

Accessibility

N	Liftbucket	N	Rigging	Inspection
N	Ladder	N	Staging	Hours: 06
N	Boat	N	Traffic Control	
N	Wader	N	RR Flagperson	
N	Inspector 50	N	Police	

State Information

BDEPT#=B16018 FHWA Select List= N

Town=Boston

B.I.N=397 AASHTO= 095.0

Identification

(8) Structure Number 012896010100
(5) Inventory Route 181000000
(2) State Highway Department District 04
(3) County Code 025 (4) Place code 07000
(6) Features Intersected **WATER MUDDY RIVER**
(7) Facility Carried **HWY BEACON ST**
(9) Location .2 MI W OF JCT BEACON&2A
(11) Kilometerpoint 0001.223
(12) Base Highway Network Y
(13) LRS Inventory Route & Subroute
(16) Latitude 42 DEG 20 MIN 59.76 SEC
(17) Longitude 71 DEG 05 MIN 34.99 SEC
(98) Border Bridge State Code Share %
(99) Border Bridge Structure No. #

Structure Type and Material

(43) Structure Type Main: Prestressed Concrete Code 501
Slab Jointless bridge type: Not applicable
(44) Structure Type Appr:
Other Code 000
(45) Number of spans in main unit 002
(46) Number of approach spans 0000
(107) Deck Structure Type - Concrete Precast Panels Code 2
(108) Wearing Surface / Protective System:
A) Type of wearing surface - Bituminous Code 6
B) Type of membrane - Preformed Fabric Code 2
C) Type of deck protection - Unknown Code 8

Age and Service

(27) Year Built 1900
(106) Year Reconstructed 1982
(42) Type of Service: On - Highway-Ped
Under - Waterway Code 55
(28) Lanes: On Structure 03 Under structure 00
(29) Average Daily Traffic 020900
(30) Year of ADT 2000 (109) Truck ADT 13 %
(19) Bypass, detour length 002 KM

Geometric Data

(48) Length of maximum span 0008.2 M
(49) Structure Length 00016.5 M
(50) Curb or sidewalk: Left 03.2 M Right 03.2 M
(51) Bridge Roadway Width Curb to Curb 014.1 M
(52) Deck Width Out to Out 021.6 M
(32) Approach Roadway Width (w/shoulders) 014.0 M
(33) Bridge Median - No median Code 0
(34) Skew 00 DEG (35) Structure Flared N
(10) Inventory Route MIN Vert Clear 05.16 M
(47) Inventory Route Total Horiz Clear 14.1 M
(53) Min Vert Clear Over Bridge Rdwy 04.93 M
(54) Min Vert Underclear ref N 00.00 M
(55) Min Lat Underclear RT ref N 00.0 M
(56) Min Lat Underclear LT 00.0 M

Navigation Data

(38) Navigation Control - No navigation control on waterway Code 0
(111) Pier Protection Code
(39) Navigation Vertical Clearance 000.0 M
(116) Vert-lift Bridge Nav Min Vert Clear M
(40) Navigation Horizontal Clearance 0000.0 M

Classification

(112) NBIS Bridge Length
(104) Highway System
(26) Functional Class - Urban Arterial
(100) Defense Highway
(101) Parallel Structure
(102) Direction of Traffic - 1-way traffic
(103) Temporary Structure
(105) Federal Lands Highways
(110) Designated National Network
(20) Toll - On free road
(21) Maintain - State Highway Agency
(22) Owner - State Highway Agency
(37) Historical Significance historic area

Condition

(58) Deck
(59) Superstructure
(60) Substructure
(61) Channel & Channel Protection
(62) Culverts

Load Rating and Posting

(31) Design Load - HS 20+Mod
(63) Operating Rating Method Allowable Stress (AS)
(64) Operating Rating
(65) Inventory Rating Method - Allowable Stress (AS)
(66) Inventory Rating
(70) Bridge Posting
(41) Structure - Open

Appraisal

(67) Structural Evaluation
(68) Deck Geometry
(69) Underclearances, vert. and horiz.
(71) Waterway adequacy
(72) Approach Roadway Alignment
(36) Traffic Safety Features
(113) Scour Critical Bridges

Inspections

(90) Inspection Date 03/14/2000 (91) Fre
(92) Critical Feature Inspection:

(A) Fracture Critical Detail	N	00	MC
(B) Underwater Inspection	Y	36	MC
(C) Other Special Inspection	N	00	MC
(*) Other Inspection	N	00	MC
(*) Closed Bridge	N	00	MC
(*) Damage Inspection			MC

Loads

Date 00/00/00	H20	Type 3	Type 3
Operating	21	41	6
Inventory	27	38	5

Posting

Status LEGAL Dat
2 Axle 3 Axle

Misc.

Bridge Name

N Anti-missile fence N Acrow Panel N

Accessibility

N Liftbucket
N Ladder
Y Boat
N Wader
N Inspector 50

N Rigging
N Staging
N Traffic Control
N RR Flagperson
N Police

Appendix

I

APPENDIX I

PRELIMINARY DESIGN REPORT

Muddy River Restoration Project Preliminary Design Report

City of Boston and Town of Brookline

March 2001

Draft Report

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2.2.5 Invasive Species Removal and Mitigation Planting

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2.3.1 Dredging
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2.3.3 Invasive Species Removal and Mitigation Planting

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2.4.1 Dredge
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2.4.3 Invasive Species Removal and Mitigation Planting

2.5 Willow Pond
2.5.1 Dredging
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Section 1
Existing Conditions

1.1 Project Location/Description

The Muddy River, which is located in parts of Boston and Brookline, Massachusetts is approximately 3.5 miles long with varying widths from 10 to over 200 ft. The river extends from Jamaica Pond to the Charles River. For the purpose of this report, the river has been subdivided into the following areas (starting with the furthest-most downstream location and working upstream): Charlesgate, Back Bay Fens, Riverway, Leverett Pond, Willow Pond and Wards Pond. The project area is shown on **Figure 1A**.

1.1.1 Charlesgate

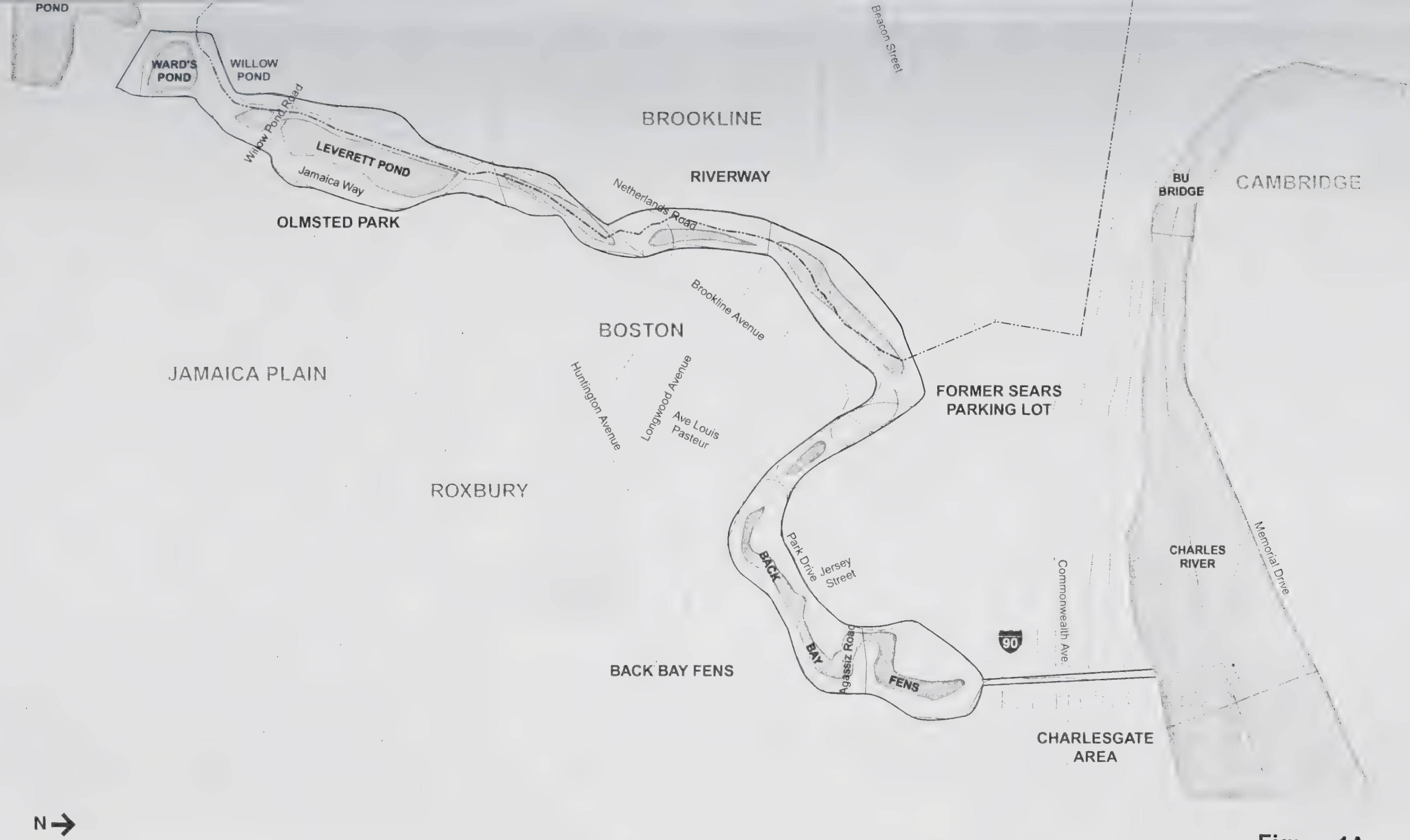
The Charlesgate portion of the Muddy River is a 1,300-ft section that runs from Ipswich Street and the Massachusetts Turnpike to the Charles River under a bridge at Storrow Drive in the Back Bay. The area is highly urbanized with significant residential, commercial, institutional and transportation uses. This section of the river has an engineered bank constructed of riprap, and it flows under seven bridges under several major roadways in the Back Bay: the Massachusetts Turnpike, Commonwealth Avenue, Beacon Street and Storrow Drive.

The average width of this length of the river is 45 ft., and it widens to approximately 75 ft. at the Storrow Drive culvert. The water depth ranges from 5 to 7 ft. and the water surface elevation is approximately el. 8.5 BCB (Boston City Base). Sediment depths range from 4 ft to 8 ft.

1.1.2 Back Bay Fens

The section of the river from Ipswich Street to just downstream of Brookline Avenue is approximately 6,600 ft. long and is divided into three sections: the Lower Fens Northern Basin from Ipswich Street to Agassiz Road, the Lower Fens Southern Basin from Agassiz Road to Avenue Louis Pasteur and the Upper Fens Pond from Avenue Louis Pasteur to Brookline Avenue. The culverted section of the river from Brookline Avenue to just upstream of the former Sears Parking lot is also included in the Back Bay Fens.

The width of the river in the Fens varies from 50 ft. wide to 260 ft. Significant *phragmites* growth in the Lower Fens has reduced the water channel to 25 ft. wide in some areas. The Northern Basin water depth ranges from 2 to 6.5 ft, and the water surface elevation is approximately el. 8.5 BCB. The sediment depth is between 2.3 and 10 ft. The water depth in the Lower Fens Southern Basin varies from 0.5 to 5.5 ft and the water surface elevation is approximately el. 8.5 BCB. The sediment thickness ranges from nonexistent in some areas to 12 ft. The water depth in the Upper Fens Pond is approximately 0.5 to 2 ft. (est.), and the water surface elevation is



CDM Camp Dresser & McKee Inc.

Figure 1A
Phase 1 Project Area

approximately el. 8.5 BCB. The sediment in this part of the river ranges from 2 to 7 ft deep.

1.1.3 Riverway

The Riverway section of the Muddy River is approximately 5,800 ft long and runs from Route 9 to the culvert just upstream of the Sears Parking Lot area. The Riverway is comprised of four sections of river. The first section of the Riverway (Riverway North) runs from the Sears Parking Lot culvert to Netherlands Road and is approximately 3,400 ft long. The width of the majority of this section is approximately 25 ft but it widens to up to 250 ft in one area. The MBTA Green Line tracks and the Longwood Station are adjacent to the western edge of the parkland surrounding the Riverway North.

Three small segments make up the Riverway South portion. The first part of the Riverway South runs from Netherlands Road to Brookline Avenue. The river splits into two channels in this area. The west channel is approximately 420 ft long and varies from 20 to 35 ft in width, and the east channel is approximately 600 ft long and varies from 15 to 70 ft in width. The second segment runs from the River Street culvert to the Brookline Avenue culvert in Brookline and is approximately 910 ft long. The watercourse ranges from 20 to 50 ft wide. The third segment runs from Route 9 (Huntington Avenue) to a culvert under River Street in Brookline. The watercourse is approximately 450 ft long and ranges from 10 to 20 ft. wide.

The water depth in the three Riverway South segments is shallow; it varies from approximately 0.7 to 3 ft., and the water surface elevation is approximately el. 8.5 BCB. The sediment is approximately 4 to 10 ft. thick. The water depth in the remaining segment of the Riverway (Netherlands Road to the Sears Culvert) ranges from 2 to 4 ft. deep and the water surface elevation is approximately 8.5 BCB. The sediment in this stretch of the river varies in thickness from 2 to 8 ft..

1.1.4 Leverett Pond

Leverett Pond is approximately 9.7 acres and is located upstream of the Riverway within the City of Boston and the Town of Brookline. The pond is approximately 1,700 ft. long from north to south and ranges in width from 20 ft. at the inlet to 460 ft. wide at its widest point. The Village Brook Drain discharges to the pond through two 7.5-ft arch culverts located at the northwest corner of the pond. The Village Brook drain is an urban storm drain that originates at the Chestnut Hill Reservoir and flows through Brookline, and drains approximately 3.21 sq. mi. of urban area. A sandbar has formed in Leverett Pond at the discharge point of the Village Brook drain due to the sand and grit that is washed from area roadways. Leverett Pond is approximately 6.5 ft. deep in some parts of the pond and the water surface elevation is at approximately el. 8.5 to 9.0 BCB (est.). The top of sediment elevation ranges from el. 4.0 to el. 8.0 BCB.

1.1.5 Willow Pond

Willow Pond is approximately 1 acre in size. It is located in Jamaica Plain. Th fed by a brook that flows into it from Wards Pond via Babbling Brook, and fr small natural history pool located to the east. This small pool is the habitat of endangered threespine stickleback. The pond discharges to Leverett Pond th 48-inch brick culvert that runs under Willow Pond Road. This culvert circum small stream channel that is currently dry but which used to connect the two The southern and eastern sides of the pond are wooded, and the west is an o area with benches and pedestrian paths. Willow Pond Road is located to the

1.1.6 Wards Pond

Wards Pond is approximately 2.4 acres and is located in Jamaica Plain. It is u of Willow Pond and drains to Willow Pond through the 1,300 ft Babbling Bro located at the north end of Wards Pond. Wards Pond is fed by groundwater and by water that drains from Jamaica Pond, which is located south of Ward The pond is surrounded by a wooded area, which is bounded by Perkins Str south, Chestnut Street to the west and north and the Jamaicaway to the east.

Wards Pond is approximately 5 ft. deep in some parts and the water elevatio approximately 46 BCB.

1.2 Hydraulic Modeling

1.2.1 Charlesgate Area

The Charlesgate area is the most downstream reach of the Muddy River, and considered to extend from the outlet of the Muddy River (river mile (RM) 0.0 Charles River) up to Ipswich Street, near RM 0.27. While there are no major c that contribute significant flow into this area of the river during storm events area conveys the largest volume of water collected by all the upstream portio Muddy River drainage area. Storm drainage from the Mass Pike discharges t Muddy River.

The normal water surface during dry-weather is approximately 8.5 ft (BCB d which is the normal water surface elevation of the Charles River. The averag during dry-weather is generally between 2 to 5 cfs. **Figure 1-1** shows a profil Charlesgate area with elevations for the existing bottom channel, normal wat surface elevation (dry-weather), and water surface elevation during the Octo The elevations shown for the October 1996 storm are taken from the modelin analysis of the river.

The October 1996 storm was recorded at a gage near the watershed to be abo inches of rain over a 37-hour period (October 19-20). This moderate to heavy over such an extended time resulted in the second largest total rainfall in the years of record.

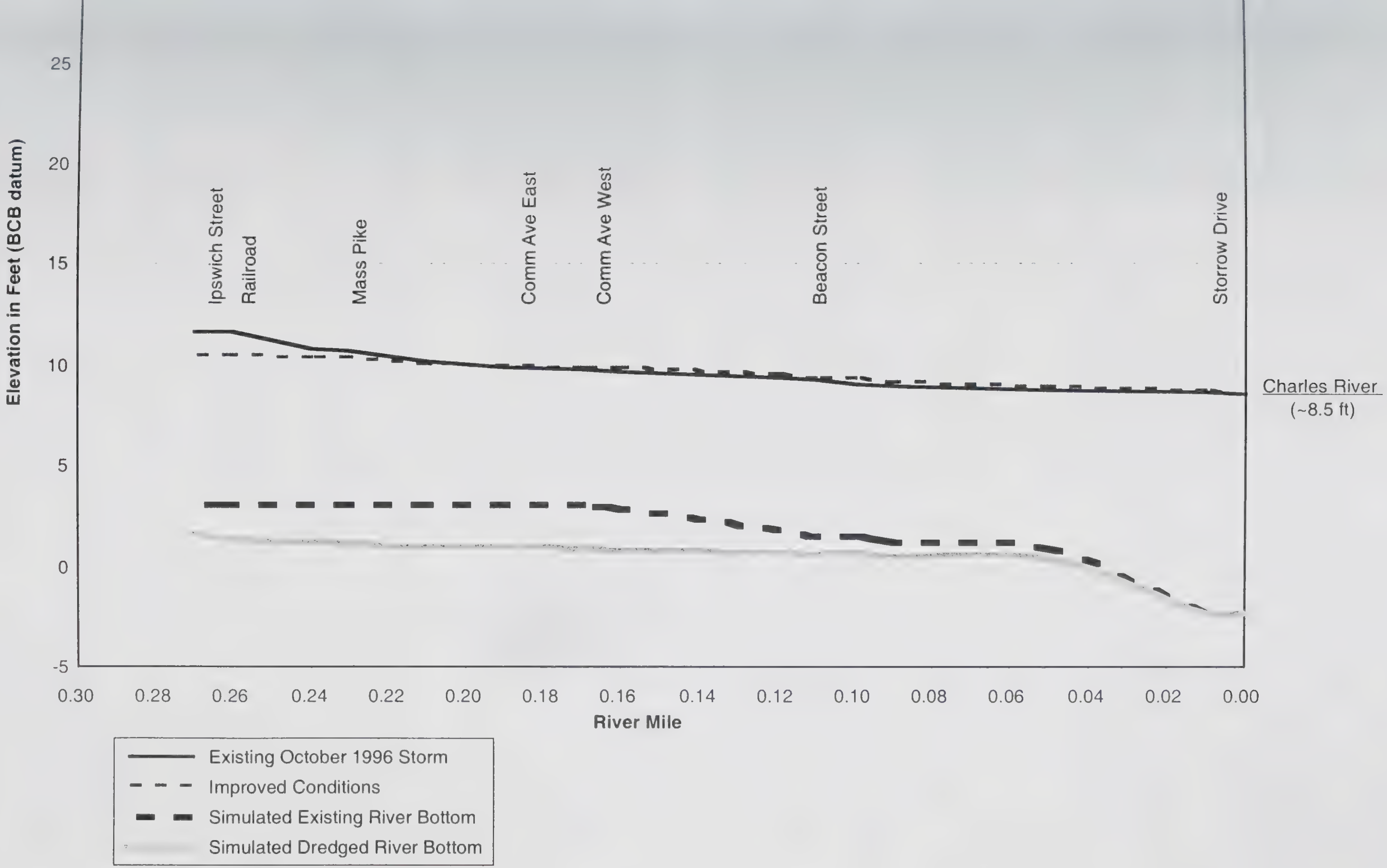


Figure 1-1
Peak Hydraulic Grade Lines for the October 1996 Calibration Storm
Existing Conditions in the Charlesgate Area

The analysis indicates that during the October 1996 storm, the peak flow in the Muddy River in the Charlesgate area reached about 1030 cfs, with a total volume of about 515 million gallons (MG) delivered. The approximate water elevation reached during the storm at the Ipswich Street bridge at the upstream end of the Charlesgate area was about 11.6 ft BCB. The profile is shown in Figure 1-1.

The hydraulic grade line (HGL), or water level, rises about 3 ft. over the 0.27 miles of river between the Charles River and the Ipswich Street bridge. Despite this rise in water elevation during the October 1996 storm, the Charlesgate area did not suffer from significant flooding.

1.2.2 Back Bay Fens

This section describes the existing hydraulic conditions observed in the Back Bay Fens reach of the river, which extends from the Ipswich Street bridge (RM 0.27) to the Riverway (RM 1.70).

The major drains contributing stormwater flow to this reach of the river are two BWSC drains: the Stony Brook Conduit (via Boston Gatehouse No. 1) and the Emmanuel College Drain. A portion of the Emmanuel College drain is discharged into the Upper Fens Pond, with the remaining portion discharging into the Muddy River Conduit (MRC). Additionally, flow from the Muddy River itself can be diverted into the MRC during high flow conditions, as was the case during the October 1996 storm.

Similar to all other reaches throughout the Muddy River, the normal water surface during dry-weather in the Back Bay Fens is approximately 8.5 ft (BCB datum), or the elevation of the Charles River. The average flow during dry-weather is generally between 2 to 5 cfs at the downstream portion of this reach. **Figure 1-2** shows a profile of the Back Bay Fens area with elevations for the existing bottom channel, normal water surface elevation (dry-weather), and water surface elevation during the October 1996. The elevations shown for the October 1996 storm are taken from the modeling analysis of the river.

The analysis indicates that during the October 1996 storm, the peak flow in the upstream end of the Back Bay Fens (flow under the Riverway) reached about 520 cfs. The resulting peak flow in the downstream portion was about 1030 cfs. Flows contributed from each of the drains during the storm are as follows:

Drain	Drainage Area (square mile)	Peak Flow (cfs)	Volume (MG)
Stony Brook Conduit	13	690	265
Emmanuel College Drain	0.15	58.7	38.2

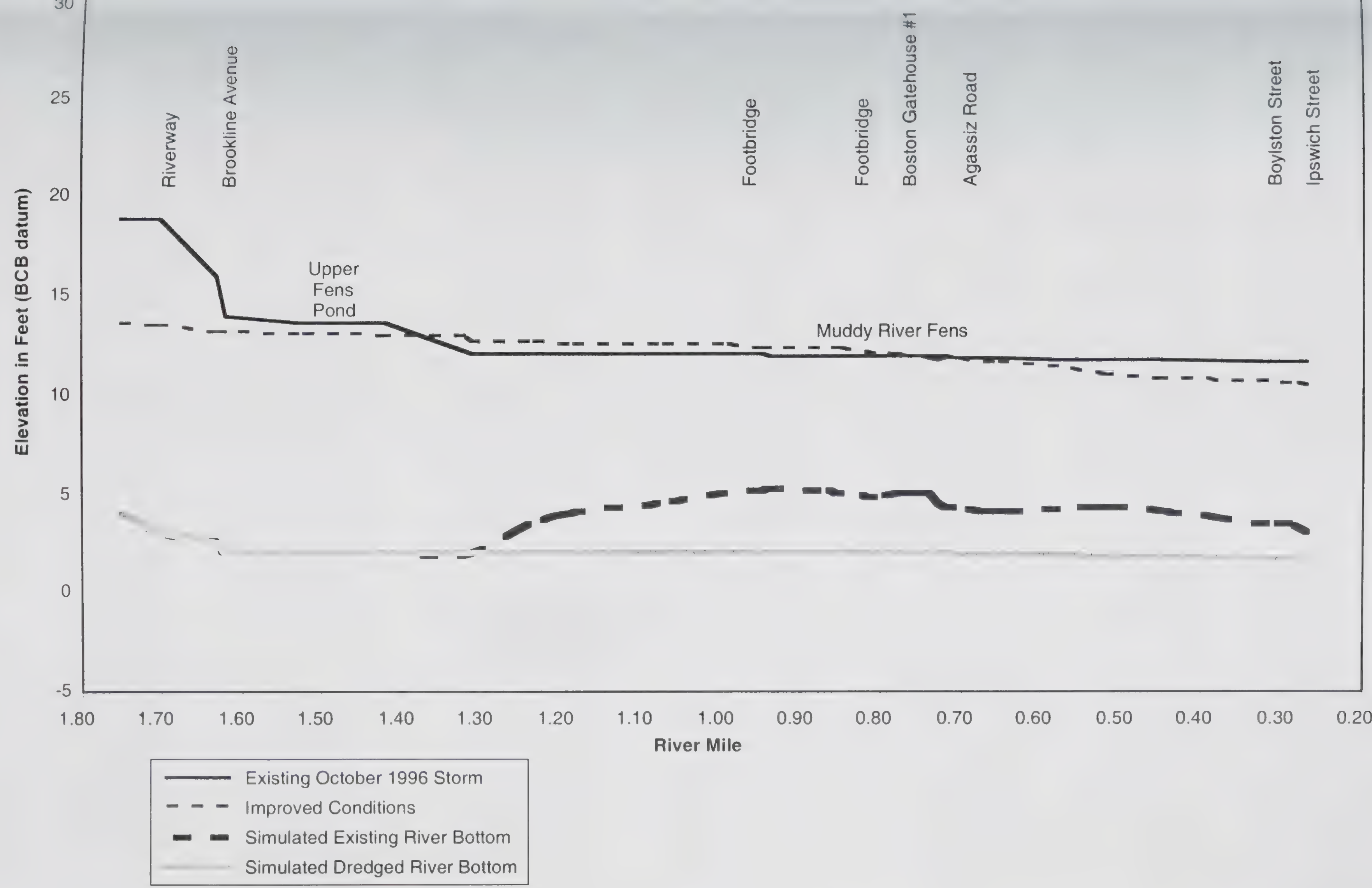


Figure 1-2
Peak Hydraulic Grade Lines for the October 1996 Calibration Storm
Existing Conditions in the Back Bay Fens

In addition, approximately 256 cfs (166 MG) was diverted from the Muddy River into the MRC at the Brookline Avenue Gatehouse. Since the gate at the Brookline Avenue Gatehouse was opened to divert flow into the MRC during the storm, the MRC was severely surcharged, which caused street flooding in the local areas draining to the MRC.

The profile of the maximum water elevations reached during the storm in the Back Bay Fens reach of the river is shown in Figure 1-2. The downstream end (at Ipswich Street) shows the peak elevation at 11.6 ft BCB. The upstream end of the reach, at the Riverway, is shown to be about 18.8 ft BCB, a rise of about 7.2 ft over a 1.44-mile stretch of the Muddy.

The profile shows that there are two major areas of headloss, or areas where flow is impeded which causes water elevations to rise. The first major area is the twin 6-ft conduits that convey the Muddy River flow underground from the Upper Fens Pond (~RM 1.42) to the upstream end of the Back Bay Fens (~RM 1.31). During the October 1996 storm, the HGL rose about 1.5 ft from an elevation of 12.1 ft BCB at the downstream end of the conduits to elevation 13.6 ft BCB at the upstream end.

The more significant cause of headloss occurs between the Riverway and the upstream end of the Upper Fens Pond. Through this reach, the Muddy River is conveyed underground through the Brookline Gatehouse via a twin set of 6-ft conduits, a 7x9 ft conduit, and another twin set of 6-ft conduits which eventually discharge into the Upper Fens Pond (~RM 1.53). The HGL shows a rise of about 5.2 ft over this stretch of the river from an elevation of 13.6 ft BCB at the downstream end, to an elevation of 18.8 ft BCB at the upstream end (Riverway).

The portion of the Emmanuel College Drain that discharges into the Muddy River Conduit actually passes through the 7 x 9 ft conduit that conveys Muddy River flow under Brookline Avenue. While this constriction does impede Muddy River flow in this culvert, the model simulations indicate that this constriction only adds about 0.3 ft of rise in water elevation in the upstream sections of the Muddy River (Riverway). The primary reason for the headloss through this area is that the culverts are undersized.

The analysis indicates that the culverts which convey flow underground at these locations are undersized, and do not have the capacity required to convey flows such as those observed during the October 1996 storm. This rise in water elevation through the Back Bay Fens, especially around the Brookline Avenue area, is the primary cause of flooding observed in the Riverway section of the Muddy River.

1.2.3 The Riverway

The Riverway section of the Muddy River extends from the Riverway (road) and Brookline Avenue area at the downstream end (RM 1.70) up to Route 9 (RM 2.80). Significant flooding occurred in this reach of the river during the October 1996 storm.

During this storm, the water levels in the Muddy River upstream of Brooklin Avenue were the highest since the hurricane-related flooding of August 195 Muddy River nearly overtopped the flood control dike in the Riverway. Bec high waters in the river, floodwaters from local drainage systems tributary t

Muddy River could not discharge, and thus they flooded local neighborhoo floodwaters flowed along the MBTA Green Line tracks located along the we of the river, and filled the Kenmore MBTA Station and flooded the tunnels a up to Arlington Street and to Symphony Station on Huntington Avenue. Ab million gallons of water reportedly entered the Green Line Stations, resultin significant damage, closure of the stations and disruption of service for seve

Flows in the Riverway during dry weather conditions are generally around The corresponding dry-weather elevation in the Riverway is about 8.5 ft BC same elevation extending up from the Charles River and similar to the other downstream reaches.

The hydraulic analysis of the entire Muddy River indicates that the reason f flooding in the Riverway is due to constrictions downstream of the Riverwa primarily in the reach of culverts underneath the Riverway (road) and Brook Avenue. The flows in the downstream end of the Riverway during the Octo storm were about 520 cfs. The major drains contributing to the Riverway are Longwood Avenue, Tannery Brook, and Huntington Avenue drains. Each o drains has the following contribution during the October 1996 storm:

Drain	Drainage Area (square mile)	Peak Flow (cfs)	Volume (MG)
Longwood Avenue	0.29	108	31.2
Tannery Brook	0.53	148	44.7
Huntington Avenue	0.08	28	9.6

The profile of the maximum water elevations reached during the storm in th area of the river is shown in **Figure 1-3**. The downstream end, where the riv twin 6-ft culverts at the Riverway road (RM 1.70) shows a peak elevation of The upstream end of the reach, at Route 9, is shown to be about 18.9 ft BCB.

The modeling profile indicates that even during the October 1996 storm, the headloss observed in the Riverway itself. In fact, model simulations indicate trend of a flat HGL in the Riverway for all storms modeled, ranging from a storm up to a 100-year storm. The rise in water elevation observed in the Ri primarily caused by the constrictions that exist downstream, mainly under Avenue.

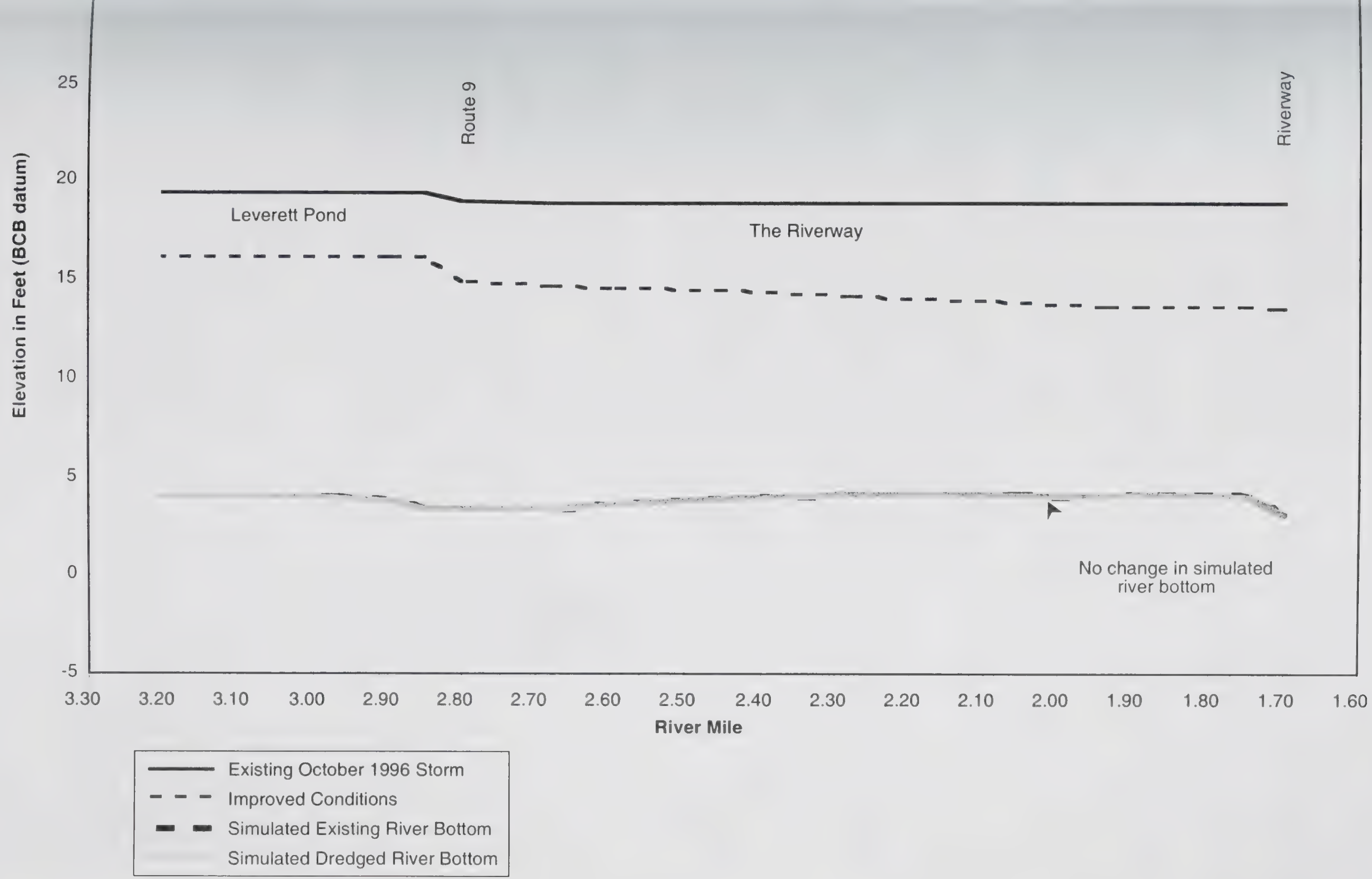


Figure 1-3
Peak Hydraulic Grade Lines for the October 1996 Calibration Storm
Existing Conditions in The Riverway

1.2.4 Leverett Pond

Leverett Pond, located upstream of Route 9 at the upstream end of the Riverway, has two major drains contributing stormwater flows – Village Brook and Daisy Field

Drains. The following describes the contribution from these drains during the October 1996 storm:

Drain	Drainage Area (square mile)	Peak Flow (cfs)	Volume (MG)
Village Brook	3.21	797	237
Daisy Field	0.07	36	9.9

With 3.21 square miles, the Village Brook drainage area is the largest area contributing to the Muddy River, via Leverett Pond.

The normal water surface elevation during dry-weather flow in Leverett Pond is about 8.5 ft BCB – which, as described in earlier sections, is the same elevation as the downstream portions of the Muddy River and the Charles River.

Peak elevation in Leverett Pond during the October 1996 storm is about 19.4 ft BCB. While the HGL in the pond itself is flat, the water surface elevation rises from the Route 9 bridge, where it is about 18.9 ft BCB, to the 19.4 ft elevation in the pond. This rise in elevation is due to minor headloss in the open channel sections between Route 9 and the pond itself.

1.3 Historic Landscape

1.3.1 Charlesgate

The existing Charlesgate site has minimal historical resources or integrity for either the Primary or Secondary Periods of Significance. Nothing remains from the Olmsted Period (Primary) and the balustrade areas are the only features that remain from the Shurtleff Period (Secondary). The existing landscape dates from 1964 and was constructed as part of the Bowker Overpass. The Gate and Gatehouse are the only character defining features from the Primary Period (Olmsted) and the balustrade areas are the only features that are extant from the Secondary Period (Shurtleff).

1.3.2 Back Bay Fens

The existing site has historical resources with integrity from both the Primary and Secondary Periods of Significance, but the Secondary Period has the greater resources extant. Documentation of this area will provide the needed information to restore the shoreline after dredging and removal of invasive plant material from the banks and to identify the extant features. Planting plans and plant lists are scant from the Primary Period and have not been found for the Secondary Period. Since The Fens currently is freshwater, the plant lists for the Muddy River will be utilized for Olmsted Park and

The Riverway, and plant massings from the historic plan documentation will the rehabilitation of areas disturbed during this part of the project.

1.3.3 Riverway Historic Landscape

The existing site has extant historical resources with integrity from the Primar of Significance. Documentation of this area will provide the needed informati restore the shoreline after dredging and removal of invasive plant material fr banks and to identify and protect the extant features. Planting plans, grading viewshed design and plant lists are complete for the Primary Period and will the information needed to rehabilitate the areas disturbed during this part of project.

1.3.4 Leverett Pond Historic Landscape

The existing site has extant historical resources with integrity from the Primar of Significance. Documentation of this area will provide the needed informati restore the shoreline after dredging and removal of invasive plant material fr banks and to identify and protect the extant features. Planting plans, grading viewshed design and plant lists are complete for the Primary Period. These w provide the information needed to rehabilitate the areas disturbed during thi segment of the project.

1.3.5 Willow Pond Historic Landscape

The existing site has extant historical resources with integrity from the Prima of Significance. Documentation of this area will provide the needed informati restore the shoreline after dredging and removal of invasive plant material fr banks and to identify and protect the extant features. Planting plans, grading viewshed design and plant lists are complete for the Primary Period. These w provide the information needed to rehabilitate the areas disturbed during thi

1.3.6 Wards Pond

The existing site has extant historical resources with integrity from the Prima of Significance. Documentation of this area will provide the needed informat restore the shoreline after dredging and removal of invasive plant material fr banks and to identify and to protect the extant features. Planting plans, gradi viewshed design and plant lists are complete for the Primary Period and will the information needed to rehabilitate the areas disturbed during this project

1.4 Habitat Values

1.4.1 Charlesgate

The entirety of the Muddy River in the Charlesgate Area is within a man-ma and concrete channel. Due to these physical constraints, no hydric soils or bo vegetated wetland are present in or adjacent to the watercourse. The adjacen parkland contains grass and some un-vegetated areas. A few trees exist on ei of the Bowker overpass. The area is a maintained urban park with extensive some mature trees, and few shrubs. *Phragmites* does not grow in this area. Scattered stands of Japanese knotweed are present.

The water in the Charlesgate area is warm in the summer as well as turbid throughout the year as a result of algae growth and/or suspended sediments. The nutrient content of the water is most likely high. In 1990, the Massachusetts Division of Fisheries and Wildlife conducted PCB analyses on the tissue of fish that had been collected from The Riverway and Back Bay Fens. The tests indicated that PCBs were contained in the edible tissue of the fish above the USDA Action Level and a Public Health Advisory was issued.

The wildlife resources of The Charlesgate area include avian and non-avian species. The Charlesgate area does not contain wetland vegetation or any natural environmental amenities.

1.4.2 Back Bay Fens

The Back Bay Fens is a maintained urban park with extensive lawns, mature trees, and some shrubs. Some areas are bare and show evidence of wash outs of storm sewers and overuse compaction. Monotypic stands of *Phragmites* dominate much of the shoreline and are also growing out into the waterway, which severely constricts the flow of water and storage capacity. Aquatic vegetation observed in The Fens includes fanwort (Cabomba caroliniana), Pickerelweed (Pontederia cordata), duckweed (Lemna minor), water meal (Wolffia), and filamentous algae.

Back Bay Fens water is warm and the wider parts of the river are not shaded. Lack of shade combined with very shallow water, resulting from siltation and the growth of submerged aquatic vegetation, promotes additional heating of the water. Algae growth and suspended sediments cause turbidity in the Back Bay Fens. The surface sediment in the Fens contains high concentrations of petroleum hydrocarbons, PAHs, PCBs, heavy metals (arsenic and lead) and DDT.

The benthic community, which typically reflects the chemical quality of the sediments and water is co-dominated by pollution tolerant tubifid worms and midges (fly larvae) and other pollution tolerant species. Testing of the sediment from the Fens to determine its bio-toxicity indicated that there is a significant impact on the survival of the amphipod (a bottom dwelling organism) and the fathead minnow test species. The benthic community serves as a food source for such bottom feeding fish as the carp, suckers and goldfish, and smaller forage fish species. Ducks and geese also feed upon these organisms. In 1990, the Massachusetts Division of Fisheries and Wildlife conducted PCB analyses on the tissue of fish collected from the Fens. The tests indicated that the edible tissue of the fish contained PCBs above the USDA Action Level. A Public Health Advisory was issued.

The wildlife resources of The Back Bay Fens include avian and non-avian species, noted through on-site observations conducted as part of the Wildlife Habitat Evaluation and Vegetation Assessment.

The Functions and Values assessment of the Back Bay Fens extends from Ipsv Street to the former Sears parking lot. The area is heavily used by the public c the wide flanks of parkland adjacent to the river.

The Victory Gardens are along the river upstream of Ipswich Street. This cons planned community gardens, which were introduced into the North Basin fil 1940. Other than the gardens, the dominant vegetation within this area is com (*Phragmites* australis). This invasive species occupies over of 5-acres of the wa and screens park vistas from footbridges and road bridges. Further upstream Agassiz Road Bridge, the War Memorial and the Rose Garden. This section is landscaped and manicured parkland, which minimizes its use as a natural ha

The area surrounding the river near Clemente Field is not has heavily landsca is not used by the public to the same extent as the downstream portion. The c vegetation near Clemente Field is comprised of pin oak (Quercus palustris), b (Quercus veluntina), northern red oak (Quercus rubra) and weeping willow (babylonica), arrow wood (Viburnum dentatum), and glossy buckthorn (Rhan frangula). It provides some wildlife habitat with mature canopy vegetation ar numerous basking and perching sites within the watercourse. Blue flag (Iris versicolor) and tartarian honeysuckle (Lonicera tatarica) are also present. Pat *Phragmites* appear throughout.

The mature canopy upstream of Avenue de Louis Pasteur near the Upper Fe consists of river birch (Betula nigra), paper birch (Betula papyrifera), norther (Quercus rubra), pin oak (Quercus palustris), black oak (Quercus velutina), si maple (Acer saccharinum), and norway maple (Acer platanoides). It provide wildlife habitat with mature canopy vegetation and numerous basking and p sites within the watercourse. The shrub community is dominated by glossy b (Rhamnus frangula), with scattered individuals of arrowwood (Viburnum de and honeysuckle. Southeast of Avenue de Louis Pasteur, there are two sizabl of *Phragmites*.

The river flows through subterranean channels under the former Sears Parki This area is an open field surrounded by major roadways and provides little, habitat values.

1.4.3 The Riverway

The environment surrounding The Riverway consists of a maintained urban with mature trees, vines, grass and some shrubs. There are some areas of bar and evidence of erosion. *Phragmites* and Japanese knotweed are dominant in number of locations. Additional aquatic vegetation that has been observed ir Riverway includes fanwort (Cabomba caroliniana), Pickerelweed (Pontederi cordata), duckweed (Lemna minor), water meal (Wolffia), and filamentous a habitat diversity along The Riverway is not as desirable as it is in Olmsted P

The water in The Riverway is shallow and warm. The wider parts of the river are not shaded which promotes additional heating. The water in The Riverway is turbid as a result of algae growth and suspended soft sediments. The surface sediment in contains high concentrations of petroleum hydrocarbons, PAHs, heavy metals and DDT. Results of sediment bio-toxicity testing indicated that there is a significant impact on the survival and growth of the amphipod (a bottom dwelling organism) test species but no impact on the survival or growth of the fathead minnow (test fish species).

The analysis of The Riverway sediment indicated that 12 taxa of invertebrates inhabit the bottom at sampling stations located adjacent to Brookline Avenue and the MBTA's Longwood Station. Pollution tolerant worms and midges (fly larvae) dominate the benthic community. Several other pollution tolerant species were also found. The benthic community serves as a food source for carp, suckers, goldfish and other smaller forage fish species in addition to ducks and geese.

The wildlife resources of The Riverway include avian and non-avian species such as crows, ducks, sparrows, Canada Goose, Blue Jays, and Northern Cardinals, which have been observed through on-site observations.

The Ecological Functions and Values analysis for The Riverway extends from Route 9 to the Back Bay Yard. A continuous footpath parallels the eastern and western sides of the river south of Route 9. The majority of areas landward of the footpath are vegetated by a mature tree canopy and manicured lawn areas that occupy the groundcover to the river's banks.

Wetlands along the Riverway have been invaded by Common Reed (*Phragmites* australis) and knotweed, which are extremely aggressive and provide a monoculture ecosystem. The *Phragmites* has expanded into the watercourse and constricted the channel causing deposition through sediment trapping. Sediment deposition will further impede the ability of the river to carry flow downgradient through coincident decreases in the water column and channel width.

Between Longwood Avenue and the former Sears Parking Lot, the vegetation is comprised of a mature oak canopy. *Phragmites*, river birch (Betula nigra), glossy buckthorn and gray birch (Betula populifolia) dominate the bank vegetation. In addition to *Phragmites* and japanese knotweed, yellow iris (Iris pseudacorus), an invasive species is present in the northern section of The Riverway. The two islands on the eastern side of The Riverway are densely vegetated with of red maple (Acer rubrum), river birch, paper birch, pin oak (Uercus palustris) and weeping willow (Salix baylonica). The islands increase habitat diversity for aquatic and land animals and provide specie with a significant refuge from the narrow amount of open space and heavy vehicular traffic within this segment of the river.

Upstream of the islands the man-made channel is perfectly linear and the vegetative cover consists of a mature oak canopy, with manicured lawn groundcover. The shrub layer consists of Japanese knotweed, with scattered individuals of gray birch (Betula populifolia). The mature tree canopy shades the watercourse and prevents th colonization of *Phragmites* here. Cobble raceways contribute sediment to the this area thereby decreasing water quality. The raceways primarily transport dust from the walkway paralleling the river.

North of Brookline Avenue, the river bifurcates and rejoins south of Netherla Avenue. The eastern branch of the channel is choked by *Phragmites* while the channel is clear. The Riverway islands contain a mature canopy of black oak velutina), northern red oak (Quercus rubra), and pin oak (Quercus palustris) trees within this area provide a food source for small mammals.

Between Route 9 and Longwood Avenue, there are outcrops of northern red (Quercus rubra), American elm (Ulmus americana), and white ash (Fraxinus americana), which provide habitat to avian species as well as small mammal Minimal wildlife habitat exists south of Brookline Avenue where the flow is subterranean and upon daylight, the banks are lined with riprap.

The principal wetland functions throughout The Riverway include sediment floodflow alteration, fish and shellfish habitat, sediment/toxicant retention, removal, production export, and sediment/shoreline stabilization.

1.4.4 Leverett Pond

Leverett Pond is located in the Olmsted Park portion of the Emerald Necklac bordered with grassed parkland along most of its perimeter. There is an eart on the Boston side (east) and a gabion formed shoreline for the majority of th Brookline side. The land that is immediately adjacent to Leverett Pond consi vegetated woodlands and grassy parklands with paved and unpaved paths. three islands along the western edge of the pond. Since the environment sur Leverett Pond approximates a maintained urban park, the biological resourc this setting. The upland plant species that are present include various decidu evergreen and flowering trees, shrubs and other woodland plants as well as species such as knotweed. There are areas of open lawn with evidence of ero as bare areas, wash outs from storm sewers, compaction from overuse and e tree roots. Aquatic vegetation that has been observed in Leverett Pond inclu fanwort (Cabomba caroliniana), Pickerelweed (Pontederia cordata), duckwe (Lemna minor), water meal (Wolffia), and filamentous algae. Wetland plants inhabiting Leverett Pond and the adjacent areas include skunk cabbage, red- dogwood, northern arrowwood, purple loosestrife and red maple.

Leverett Pond is a warm water Pond due to the temperature of water from Pond, natural heating, and its inherent shallow depth. The water appears tu result of algae growth and suspended sediments. Bio-toxicity testing of sedi indicated that there was a substantial and significant impact on the survival amphipod (a bottom dwelling organism) but no significant impact on the su the fathead minnow.

Benthic analysis of Leverett Pond sediment indicated that 12 taxa of invertebrates inhabit the bottom. The benthic community was found to be dominated by pollution tolerant worms. The next most dominant group of benthic organisms was pollution tolerant midges (true flies). In addition, various species of insects, crustaceans, molluscs and leeches were present in the pond. Twelve species of fish were identified in Leverett Pond. In addition, the Blue back herring, an anadromous fish that migrates from the ocean into freshwater to spawn with the juveniles then returns to the ocean, was observed in May-June of 1995 and 1996.

The wildlife resources of Leverett Pond include avian and non-avian species that have been observed through on-site observations that were conducted as part of the Wildlife Habitat Evaluation and Vegetation Assessment. Twenty species of birds were identified and two species of turtles.

The ecological functions and values assessment indicated that here are approximately 0.181 acres of wetlands around the pond. Due to the narrowness of the wetlands, flood storage or sediment retention is minimal. Passive recreation activities have degraded much of the surrounding native vegetation, therefore, invasive species, such as purple loosestrife, dominate. Principal wetland functions for Leverett Pond include fish habitat and recreation.

The areas around the pond are vegetated by manicured lawn of various grasses with a mature tree canopy. In the majority of areas, the manicured lawn extends to the pond's shoreline. Active planting of shrubs in past years along the western side of the pond has replaced lawn cover. The tree canopy is comprised of sugar maple (Acer saccharum), pin oak (Quercus palustris), sweet gum (Liquidambar styraciflua), black cherry (Prunus serotina), black oak (Quercus velutina), northern red oak (Quercus rubra), and box elder (Acer negundo). Shrubs consist of purple loosestrife, sweet pepperbush (Clethra alnifolia) and arrowwood (Viburnum dentatum).

The vegetated islands located on the western side of the pond provide good wildlife habitat. Vegetation on the islands consists of river birch (Betula nigra), balsam poplar (Populus balsamifera), paper birch (Betula papyrifera), white ash (Fraximus americana), and tupelo (Nyssa sylvatica). The narrow channels between the shoreline of the pond and the islands lend to the diversity of habitats available in Leverett Pond for aquatic species. Furthermore, the islands provide excellent habitat for reptiles, amphibians and avian species. This habitat diversity leads to species diversity, as shown by the assortment of aquatic species found in Leverett Pond. Intraspecies comparison amongst the species was observed. The preferred habitat for aquatic species within Leverett Pond is hard-bottomed areas adjacent to steep banks.

1.4.5 Willow Pond

Willow Pond is also situated in the Olmsted Park portion of the Emerald Necklace. Steep slopes surround the Pond on its eastern, southern and western sides. The land that is immediately adjacent to Willow Pond consists of vegetated woodlands and grassy parklands with both paved and unpaved paths. The inventory of vegetation in

the Willow Pond area includes the watercourse from Willow Pond Road to th
pedestrian bridge at Wards Pond. The analysis determined that there are nur
canopy trees and several flowering and evergreen trees in the area, as well as
lawn area, shrubs, woodland plants and invasive species. The area around W
Pond showed evidence of erosion such as bare lawn, wash outs of storm sew
desire lines overuse compaction and exposed tree roots. Wetland plants that
the area include multiflora rose, red-osier dogwood, northern arrowwood an
loosestrife. Aquatic vegetation observed in Willow Pond includes fanwort (C
caroliniana), water cress (Nasturtium officinale), water starwort (Callitricha
duckweed (Lemna minor), water meal (Wolffia), and filamentous algae.

Willow Pond is fed by water from Wards Pond via the Babbling Brook, the a
Spring Pond, the Chestnut Street Drain, and groundwater seepage. The wate
Willow Pond is warm due to the water temperature of Wards Pond as well a
natural heating and its inherent shallow depth. Spring Pond is almost totally
groundwater discharge and is quite cool and clear year-round. The water in
Pond is generally more turbid as a result of algae growth and suspended sed

Several species of arthropods, annelids, crustaceans and molluscs form the b
community in and around Willow Pond. Black fly larvae, which are indicato
continually running cool water, were found inhabiting the surface of rocks lo
the dam structure between Spring Pond and Willow Pond. In addition to the
caddis fly larvae, which as a group are facultative to intolerant of pollution, h
observed in riffles in the Babbling Brook between Wards Pond and Willow P

The aquatic and wildlife resources that are present around Willow Pond are
in nature, which reflects the diversity and good quality of the surrounding te
and aquatic habitat. These areas include the adjacent woodlands, the inlet str
from Wards Pond, and the only remaining Olmsted natural history pool, kno
Spring Pond.

Various fresh water fish species inhabit Willow Pond. In addition, the three-
stickleback, Gasterosteous aculeatus, was found in Spring Pond and in the s
immediately below the dam that separates from Spring into Willow Pond. Th
Massachusetts Natural Heritage Program classifies the three-spine sticklebac
threatened species. The three-spine stickleback was also found to inhabit a s
area in Willow Pond where the water is cool and clean.

The wildlife resources of Willow Pond include avian and non-avian species
observed during the Wildlife Habitat Evaluation and Vegetation Assessmen
species that were observed at and around Willow Pond include three species
mammals, seven species of birds and two frog species.

An Ecological Functions and Values analysis was conducted for the Willow
area. The area receives more pedestrian activity than the rest of the river. Wa
paths are worn and vegetation is impacted by passive activities. There are

approximately 0.82 acres of wetlands around the pond. Wetland vegetation consists of a small amount of emergent vegetation at the outfall of the Babbling Brook and a fringe of scrub/shrub throughout. Principal wetland functions and values consist of fish and shellfish habitat, passive recreation, and endangered species habitat.

The majority of the pond's wetlands are classified as scrub/shrub. Shrubs in the area consist of red osier dogwood (Cornus stolonifera), sweet pepperbush (Clethra alnifolia), American bittersweet (Celastrus scandens), weeping willow (Salix babylonica), barberry (Myrica pensylvanica), and virginia rose (Rosa virginiana). A significant stand of emergent vegetation exists at the outfall from the Babbling Brook. The emergent vegetation is confined to two small island areas comprised of broadleaf arrowhead (Sagittaria latifolia), pickerelweed (Pontederia cordata), barnyard grass (Enhinocloa crusgalli), jewelweed (Impatiens capensis), purple loosestrife (Lythrum salicaria), rushes and mannagrass (glyceria candensisI). The western side of Willow Pond consists of manicured lawn with a shrub fringe, while the eastern side is forested.

Due to the narrowness of the wetlands surrounding the pond, flood storage capacity and/or sediment retention is considerably hindered. Hydric soils are present in the wetland and are able to retain some flood water.

1.4.6 Wards Pond

The Wards Pond area is minimally impacted by pedestrians and has minimal urban development; thus it remains the most natural environment within the Muddy River system. The land immediately adjacent to Wards Pond includes vegetated woodlands with unpaved paths. A wooden boardwalk has been constructed along the southern edge of the Pond to protect the wetlands and to facilitate access and use of the parkland.

An inventory of vegetation documented the presence of various types of trees, shrubs, vines and invasive species. No manicured lawns and little erosion of the banks exist at Wards Pond. Sound water quality of Wards Pond supports a diverse and healthy wetland population. Thirteen species of wetland plants were observed in and around Wards Pond. The diverse vegetative community supports a strong diversity of wildlife habitat.

The aquatic and wildlife resources present at Wards Pond reflect the diversity and good quality of the surrounding habitat as well as the aquatic habitat. Groundwater seepage and direct flow from Jamaica Pond provide clear, well-oxygenated water, which creates a healthy aquatic habitat. The water is warm because of the temperature of water from Jamaica Pond. The benthic community contains numerous types of insects, crustaceans, molluscs and worms. In addition to these species, caddis fly larvae, which intolerant of pollution, have been observed in riffles in the Babbling Brook between Wards Pond and Willow Pond. Nine species of fish have been observed in the pond. The wildlife resources of Wards Pond include avian and non-avian species that have been observed either by the public or through on-site observations that were conducted as part of this project. Wildlife species that have been observed include several species of small mammals, numerous bird spe amphibians and reptiles.

Most of the pond's wetlands are classified as scrub/shrub. Shrubs in the are glossy buckthorn (Rhamnus frangula), weeping willow (Salix babylonica), ri (Betula nigra), gray birch (Betula populifolia), paper birch (Betula papyrifera arrow wood (Viburnum dentatum). The herbaceous layer of plants consists jewelweed (Impatiens capensis), sensitive fern (onoclea sensibilis), and purp loosestrife (Lythrum salicaria). In many places there are healthy emergent ve wetlands extending into the water. Such species include narrow-leafed catta angustifolia), swamp loosestrife (Lysimachia terrestris), and lily pads. The p wetland function/values for this wetland system are wildlife habitat, recreat product export. The wetlands do function to retain sediments and toxicants, remove nutrients.

Due to the narrowness of the wetlands around the pond, flood storage capac very low. Hydric soils are present around the wetland and are able to retain floodwater. The wetlands filter some sediments and restrain toxicants from Wards Pond.

The southwest portion of the pond receives a large amount of groundwater seepage from the hillside. The groundwater is filtered through the emergent wetland and eventually discharges into the pond. The clear water quality of Pond indicates that sediment retention may occur in the wetland. These wet of high importance because of the potential sources of sedimentation upgra the pond (i.e. The Riverway and The Jamaicaway).

Section 2
Proposed Improvements

This section describes the work that will be performed in order to meet the five project objectives that were outlined in the EIR. Proposed Improvements include:

- Full dredging of the Muddy River from Charlesgate to Wards Pond;
- Infrastructure improvements (daylighting and culvert enlargement) in the Back Bay Fens;
- Invasive plant species removal;
- Mitigation planting; and
- Historical treatment.

Specific improvements for each of the river sections are described in detail below. Design drawings can be found in Appendix A.

2.1 Charlesgate Area

2.1.1 Dredging

Sediment in the Charlesgate area will be dredged using hydraulic dredging methods. A portable, barge mounted dredge will be used in the open channel sections, and mechanical dredging methods or pumps will be used to remove sediment under the low overpasses to parts of the channel that are accessible to the barge. The dredge will pump the material to the Charlesgate staging area from the barge through a pipeline that is attached to the dredge. The pipeline will be floated in the river to avoid disrupting vehicular and pedestrian traffic by placing it on the roadways.

The entire width of the open channel will be dredged to el.1.03 BCB in the Charlesgate area. The current elevation of the top of the sediment ranges from approximately el. 0.4 to el. 4.3 BCB. This would result in approximately 3,300 c.y. of material.

As part of the dredging, a stop log structure under the railroad bridge just downstream of Ipswich Street will be removed. The stop logs are a constraint to flood flows and also cause a backup of sediments just upstream of the stop logs.

Since the dredging in Charlesgate will precede the dredging in the Back Bay Fens, some sediments upstream of the stop log structure will be removed as part of the Charlesgate work. These sediments will be removed upstream of Ipswich Street to nearly Boylston Street to taper the sediment left in place from about 1.03 ft BCB at Ipswich Street to the current depth (about 4.0 ± BCB) at Boylston Street. This will prevent sediment form sloughing into the Charlesgate section until the Back Bay Fens is completely dredged in the next contract.

The proposed staging area for the Charlesgate dredging is located in the gras adjacent to Commonwealth Avenue (Eastbound) under the Bowker overpass Sheet 2-7). Dredged sediment will be pumped to mechanical belt filter presse mounted on 18-wheel flatbed trucks. The dewatered sediment will be loaded wheel dump trucks by conveyor belt for transport and disposal to an off-site The decanted water will be treated and discharged back into the Muddy Riv a silt curtain. Treatment will include settling in pre-fabricated tanks to meet average discharge criteria of 5 mg/l with a maximum of 100 mg/l. **Figure 2-** schematic of a typical staging area.

Dewatered sediment will be loaded onto 18-wheel dump trucks at a rate of approximately 1 truck per hour. Based on the chemical quality of the materia approximately 3,300 c.y. of sediment in the Charlesgate section may be dispo an unlined landfill. The Contractor will have to identify an unlined landfill t accept this material (including physical condition such as wet material with proportion of fine material) or upgrade to a more restrictive landfill. For pur estimating costs we have assumed that the material will be disposed at an ou lined landfill and not an in-state unlined landfill. Based on the volume of sed be processed, and the size of the staging area, which will allow for four belt presses, the length of time to mobilize, dredge, dewater and dispose of the m the Charlesgate area is approximately six months.

2.1.2 Charlesgate Historic Treatment

As discussed in Section 1.3.1, the Charlesgate Area has minimal historical re integrity. The Gate and Gatehouse are features from the Olmsted Period and balustrade remains from the Shurtleff Period. These features will be protecte construction.

2.1.3 Invasive Species Removal and Mitigation Planting

Treatment at Charlesgate will include stabilization of banks after dredging; in kind of existing riprap bank and restoration of landscape in the staging ar removal of some vegetation will be required to accomplish the work of this addition, the project plans call for the removal of Japanese knotweed that is the Charlesgate area. The upland vegetation adjacent to the project areas, an vegetation within staging areas and access points, will be protected to their pruned and fertilized as a means of minimizing impact to them. The protect will be restored in kind as required by post-construction. Protection of plant and new plantings will be completed under the supervision of a certified ar

Preliminary design plans (L-1 to L-5) are included in Appendix A showing t proposed treatment in the Charlesgate area.

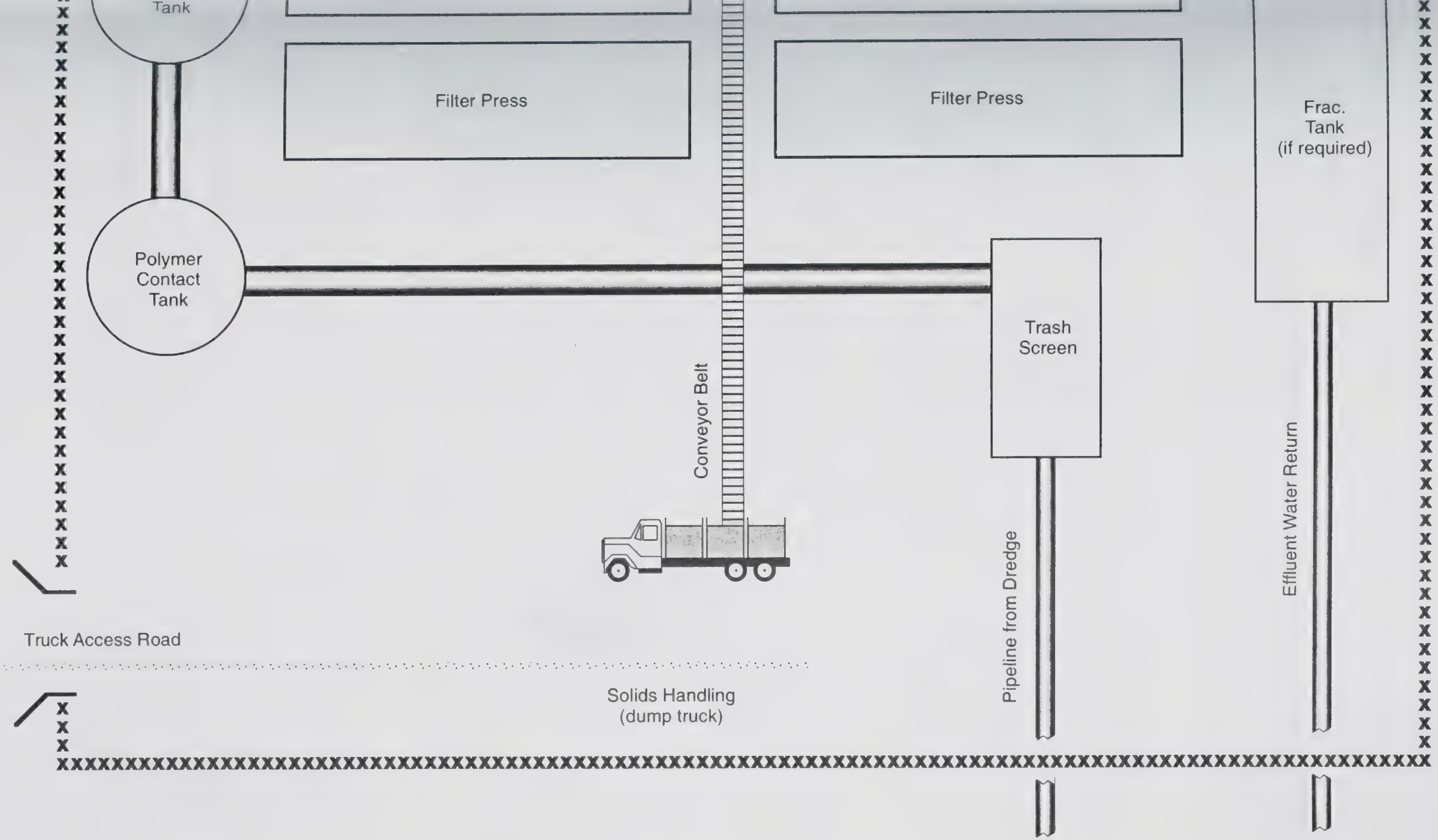


Figure 2-1
Schematic of Staging Area

2.2 Back Bay Fens

2.2.1 Dredging

Dredging in the Back Bay Fens will involve bank to bank dredging to an elevation of 1.03 BCB at Ipswich Street in the Lower Fens Northern Basin to 2.03 BCB at Brookline Avenue in Upper Fens Pond. This will include complete *phragmites* removal. The dredged sediment will be pumped to one of three staging areas in the Fens for dewatering.

The sediment and *phragmites* that will be removed from the Fens Northern Basin will be processed at the Agassiz Road staging area. (See Sheet 2-9) Dredging equipment will enter the river directly from the staging area. Of the approximate total volume of 25,000 c.y. of sediment that will be dredged, approximately 1,300 c.y. that will be removed from just downstream of Agassiz Road and from between Boylston Street and Ipswich Street will be disposed of in an out of state landfill. About 23,800 c.y. of the remaining sediment will be dredged from the Northern Basin must be disposed of in a RCRA landfill. Limits of sediment designated for each disposal area will be included on the design drawings based on information in Appendix C.

Sediment and *phragmites* in the Fens Southern Basin from Agassiz Road to approximately 1,600 ft. downstream of Avenue Louis Pasteur will be processed at the Lagoon (Jersey Street) staging area that will be located on parkland that is located between Clemente Field and the Rose Garden (See Sheet 2-11). It is adjacent to the Lagoon section of the Fens Southern Basin so dredging equipment will access the river directly from the staging area. The volume of sediment dredged from this stretch of the river will be approximately 54,000 c.y. Analytical results indicate that about 28,400 c.y. will be disposed of in an out of state landfill, approximately 19,000 c.y. will be disposed of in a RCRA landfill and the approximate remaining 6,600 c.y. may be disposed of in an unlined landfill. For purposes of pricing we have assumed that sediment that is chemically suitable for disposal at in-state unlined landfills will be disposed at out-of-state lined landfills. CDM's experience has been that the physical conditions of the sediment (percent moisture and percentage of fine material) are likely to cause the unlined landfills to reject the material thereby requiring an alternate disposal site. Limits of sediment designated for each disposal area will be included on the design drawings based on information in Appendix C.

Material from the Upper Fens Pond and approximately 1,600-ft of the Lower Fens Southern Basin will be processed at the Fens at Louis Pasteur staging area (See Sheets 2-12 and 2-13). Dredging equipment will access Upper Fens Pond directly from the staging area. The sediment will be processed in batches based on its chemical quality and disposal requirements. Laboratory analyses indicate that of the approximately 16,300 c.y. of sediment to be dredged from this area, about 2,700 c.y. will be disposed of in an unlined, in-state landfill and the approximate remaining 13,600 c.y. will be disposed of in an out of state landfill. Limits of sediment designated for each disposal area will be included on the design drawings based on information in Appendix C. The culverts under the proposed staging area will be replaced with an open channel as part of this project; therefore, the work must be sequenced so that the dredging ar dewatering in this area is completed prior to the start of the culvert replacem

Dredging of sediments will include removal of additional material to form sedimentation basins as part of implementing Best Management Practices (B BMPs are not discussed herein the Preliminary Design Report in general sinc are outside the river, however the sedimentation basins would be done as an part of the dredging.

Sedimentation basins, formed by overdredging, are recommended in three a the Back Bay Fens. These overdredged area would serve as low points where sediment can settle out without occupying any additional channel capacity, a be re-dredged in the future. These areas are open water areas within the new dredged river channel. The additional volume of sediment that is to be remo the sedimentation basins for each area is as follows:

Downstream of Louis Pasteur Bridge	532 cubic yards
Downstream of BWSC Gatehouse 1	12,445
Victory Gardens	2,541

These sedimentation basins are shown on the Preliminary Design Plans at th this Appendix.

Based on the estimated quantities and staging areas the length of operations Back Bay Fens area including mobilization, *phragmites* removal, dredging, de and disposal is approximately 14 to 18 months.

2.2.2 Culvert Enlargement in Back Bay Fens

There are three areas proposed for culvert enlargement: Riverway, Brookline and Avenue Louis Pasteur.

Brookline Avenue

The Brookline Avenue Gatehouse receives the two existing 72-in. diameter c drains and discharges through two drains, a 9 ft x 11 ft Muddy River Condu 7 ft x 9 ft pipe. The 7 ft x 9 ft oval brick drain transports the water to the Upp Pond while the Muddy River Conduit discharges water to the Charles River. improvements were made to the Gatehouse and a large rectangular shaped valve was installed while an overflow weir to the Muddy River Conduit wit Gatehouse was removed. Currently the butterfly valve is left open allowing split in flow between the 7 ft x 9 ft drain and the Conduit. In addition, there sufficient clearance above the valve to allow water to overflow and enter the River Conduit in a high water condition.

The 7 ft x 9 ft drain is piped under Brookline Avenue and converts to two 72-in. concrete drains that outlet below the water surface at the Upper Fens Pond. Construction drawings of the 7 ft x 9 ft drain shows 45-in. diameter cast iron and 51-in. x 51-in. brick Emmanuel College drains cut through the top of it, contributing to additional restrictions in the system. It also appears from the construction drawings that the drain was set at an elevation below the Muddy River downstream, creating a "sump" in the system. It is proposed to replace the existing 7 ft x 9 ft drain with one 10 ft x 24 ft arch culvert as shown in Sheet 2-1. Historically consistent headwalls will be constructed at the upstream and downstream ends of the new culvert. The facing on the headwalls will be historically consistent material.

Riverway

The existing pipelines under the Riverway will be augmented with a new culvert about 183 ft. in length. Since access is provided at each end of the shortened culvert, blockage is much less likely and more easily removed. Therefore the screen structure at the inlet side of the drains will be removed. The structure was meant to screen debris thereby preventing clogging or build-up in the long run of pipe. The new culvert will consist of one 10 ft x 16 ft arch culvert installed alongside the existing twin 72-in. drains as shown in Sheet 2-2. The existing drains will be maintained and protected during and after construction. The new culvert will be installed on the west side of the existing culverts. A small area will be left to the east of the inlet to create an eddy effect, trapping debris in the corner. This alignment matches up well with the natural channel with a modified historical alignment as described below in Section 2.2. Historically consistent headwalls will be constructed at the upstream and downstream ends of the new culvert. The headwalls will be constructed to encompass the two existing drains and the new culvert to create one singular headwall at each end. The facing on the headwalls will be historically consistent material.

Avenue Louis Pasteur

There is a 16-ft wide brick arch culvert sitting on large rectangular stone blocks under Avenue Louis Pasteur. The face of the culvert at the outlet consists of large pudding stone stacked and sloping outward, typical of other culverts in the Emerald Necklace. The downstream headwall will be restored, a new upstream headwall will be reconstructed and deposited sediment will be dredged from the bottom of the culvert. The restored and reconstructed headwalls will be faced with pudding stone. The topographical survey indicates that approximately 2-1/2 ft. of sediment accumulation must be removed. If the sediment is removed, the culvert would have he necessary capacity to avoid being a constriction in the system. This existing culvert location is shown in Sheet 2-3.

2.2.3 Daylighting Culverted Sections of the Muddy River

The two areas proposed for daylighting or open channeling are the former Sears Parking Lot and Upstream of Avenue Louis Pasteur. A 4-foot wide shelf for wetland replication will be also provided on each side of the channel.

When the Muddy River was originally designed by Fredrick Law Olmstead, former Sears Parking Lot and Upstream of Avenue Louis Pasteur were natur channels. As the surrounding land was developed, twin 72-in. pipes were lai bottom of the channels and were covered to create space for a parking lot an grassed park. A large concrete drainage structure at the entrance to the culve the former Sears Parking Lot was built with bar racks on three sides and a gr the top to trap debris and still allow water to navigate into the pipes. The twi diameter concrete pipes under the former Sears Parking Lot are each 520 ft. i

Upstream of Avenue Louis Pasteur there are also twin 72-in. diameter concre each approximately 355 ft. in length. The inlet end is not visible from the sur construction drawings show the pipes set at an elevation lower than the Mu downstream. The drains are buried and connect to the culvert at Avenue Lo Pasteur. A large cast-in-place concrete structure was built around this conne

These drains in both locations are undersized and cannot handle the large ru volumes during heavy storm events, which causes the bottleneck effect. Ope these two areas up will relieve the system.

Former Sears Parking Lot - The daylighting of the former Sears Parking Lot constructed as a natural looking channel 311 ft. long by approximately 125-1 wide and approximately 13 ft. deep with slight modifications from the histor shoreline. The modifications to the alignment create more room for walkwa lines up the new channel with the recommended culvert alignment upstrea Riverway. Erosion control measures consisting of lining the bottom and side used. Sheet 2-4 shows the proposed daylighted alignment. Existing wooden foundations will be removed as necessary to facilitate construction of the ne bottom. Excavated soils will be disposed of at offsite locations as non-contan material based on the laboratory test results from test borings.

Upstream of Avenue Louis Pasteur - The daylighting upstream of Avenue L Pasteur is 363 ft. long by approximately 90-160 ft. wide and varies from 12 t deep. This channel more closely matches the historic shoreline. The design w include replicating an island that Fredrick Law Olmstead had originally des Erosion control measures consisting of lining the bottom and sides will be u 2-5 shows the proposed daylighted alignment. Excavated soils will be dispo off site locations as non-contaminated material based on laboratory test resu test borings.

Erosion Control Measures

Daylighting the channels will require erosion control measures on the side s bottom of the Muddy River. Erosion will be controlled through the use of ri erosion control mats. The bottom of the channel will be excavated, and filter under a layer of gravel. Above the gravel will be a layer of larger stone or ri will prevent erosion of the bottom and sides of the channel by high flowrate an aesthetically pleasing natural channel the riprap/gravel layer will end at line and a natural grassed slope will then emerge. Because the water level ri falls, the soil below the grass would not have strength to resist sloughing. Therefore, the recommendation is to use a permanent erosion control mat to add strength to the soil. The mat would begin below water level, and be overlapped by the riprap/gravel layers. It would then be rolled up the side slopes to a level area. The mat will be permanent and designed so that wetland plants and grass can grow through it.

Wetland Replication at Daylighted Areas

The areas where daylighting will occur, provides for wetland replication on each bank. A four-foot wide shelf, each side, will be constructed next to the water line. The wetland plantings are described in Section 3.4. A typical daylighting cross section is shown in Sheet 2-6.

2.2.4 Back Bay Fens Historic Treatment

Treatment at Back Bay Fens will include the following steps:

- Restore original shoreline that was filled during the Shurtleff Period to the Secondary Period of Significance and preserve shoreline in areas that still represent the Primary Period. Stabilization of banks after dredging will include plant massing to reflect the Primary and Secondary Periods of Significance.

- Restore daylighted areas at the former Sears Parking Lot and between the Fens Bridge and Brookline Avenue using grading plans, plant massing, view plans, and planting plans from the Primary Period of Significance. Work will include restoring much of the banks and original shoreline as well as for the reconstructing the original island upstream of the Fens Bridge.

- Complete the new and restored culvert headwalls with planting restoration to reflect the Primary Period of Significance. Rehabilite the pedestrian and equestrian path system taking into consideration the removal of a historic bridge along with land takings by the MDC to accommodate widening of the roads, and the current pedestrian and bicycle circulation and crosswalks.

- Restore the Lagoon staging area using the 1926 Shurtleff Master Plan, which includes extensive shrub planting, two east/west paths to two footbridges and a north/south cross path. The lagoon was a reflecting pool for the Museum of Fine Arts.

2.2.5 Invasive Species Removal and Mitigation Planting

The full dredging plan includes complete removal of invasive *phragmites* and other species. Plantings will restore landscape to reflect both the Primary and Secondary Periods of Significance using wetland planting, bank planting and upland planting of both shrub and tree layers, and by creating turf covered banks with a wetland edge. The specific plantings will be selected from Olmsted's Plant List (Appendix D). In those locations adjacent to the sedimentation basins, the plantings with wetland edge will be replaced with a mat and non-wetland plantings. These locations are limited in number and width.

2.3 Riverway

2.3.1 Dredging

The proposed dredging will be performed using hydraulic dredging method combination of hydraulic dredging and mechanical dredging with small, spe designed equipment may be required in the narrow, shallow river segments Riverway South.

The bottom of the river will be dredged to an elevation ranging from el. 3.25 el. 4.0 BCB from the Riverway culvert to Huntington Avenue. The current to sediment elevation in the Riverway ranges from el. 4.0 to el. 7.0 BCB. Bank to dredging will result in approximately 20,200 c.y. of sediment and 10,000 c.y. *phragmites* removal. This includes approximately 2,700 c.y. of overdredge ma that will be removed from three areas: upstream of Brookline Avenue, down Netherlands Road and upstream of the Riverway culvert.

The sediment that is dredged from the Riverway will be pumped to a staging that will be located at Netherlands Road (See Sheet 2-17). Dredging equipme access the river directly from the staging area on the Boston side of the river. sediment will be processed in batches based on its chemical quality and disp requirements. Laboratory analyses indicate that approximately 3,300 c.y. ma disposed of in an unlined landfill, approximately 6,300 c.y. will be disposed lined landfill and the remaining 10,600 c.y. will be disposed of in an out-of-st landfill. For purposes of pricing we have assumed that sediment that is chem suitable for disposal at in-state unlined landfills will be disposed at out-of-sta landfills. Our experience has been that the physical conditions of the sedime (percent moisture and percentage of fine material) are likely to cause the unl landfills to reject the material thereby requiring an alternate disposal site. Li sediment designated for each disposal area will be included on the design dr based on information in Appendix A.

Three open water areas are proposed for overdredging to create sedimentati in the Riverway. These areas and volume of sediments are:

Upstream of Riverway Culvert	1,000 cubic yards
Downstream of Netherlands Road	284
Upstream of Brookline Avenue	1,440

These areas are shown on the Preliminary Design Plans at the end of this Ap

Based on these estimated quantities and staging areas, the length of operatio Riverway area including mobilization, *phragmites* removal, dredging, dewat disposal will be 6 to 9 months.

2.3.2 Riverway Historic Treatment

Treatment in The Riverway will include the following activities:

- The original shoreline and grading will be restored to the Primary Period of Significance. Stabilization of banks will include plant massing and the construction of "turf covered banks" to reflect the Primary Period of Significance. Planting will include wetland planting, bank planting and upland planting of both shrub and tree layers to improve wildlife habitat and to restore the historic designed landscape. Turf covered banks will include a wetland edge to improve wildlife habitat and lawn on banks and upland to restore the original historic viewsheds. Primarily the Olmsted plant lists will be utilized for plant selection.

- The two existing islands just north of the pedestrian and equestrian bridges near the Longwood MBTA Station will be replanted as described above. The third island near Netherlands Road will also be replanted to reflect the Primary Period of Significance. The island banks will include a wetland shelf.

- Existing desire line paths, which have resulted in erosion of lawn areas, will be regraded and constructed either as new paths or planting, will be utilized to control and redirect movement in an effort to incorporate BMP's.

- Refer to Preliminary Design Plans L-24 to L-36 for proposed treatment in Riverway.

2.3.3 Invasive Species Removal and Mitigation Planting

The phramites and other invasive species currently growing in the Riverway will be removed during river dredging. Rehabilitation of the landscape will include both plant massing and the construction of "turf covered banks" to reflect the Primary Period of Significance. Planting will include wetland planting, bank planting and upland planting of both shrub and tree layers to restore the historic designed landscape and to improve wildlife habitat. Turf covered banks will include a wetland edge to improve wildlife habitat and lawn on banks and upland to restore the historic viewsheds. The Olmsted plant lists will be utilized for plant selection. (See Appendix D).

2.4 Leverett Pond

2.4.1 Dredge

Sediment in Leverett Pond will be dredged using hydraulic dredging methods. Approximately 1.5 ft of sediment will be dredged from the entire pond and the sandbar will be removed. This will result in approximately 23,900 c.y. of sediment. Approximately 7,200 c.y. may be disposed of in an in-state lined landfill and the remaining 16,700 c.y. will be disposed of in an out of state landfill. For purposes of pricing we have assumed that sediment that is chemically suitable for disposal at in-state unlined landfills will be disposed at out-of-state lined landfills. Our experience has been that the physical conditions of the sediment (percent moisture and percentage of fine material) are likely to cause the unlined landfills to reject the material thereby requiring an alternate disposal site. Limits of sediment designated for each disposal area will be included on the design drawings based on info in Appendix A.

The dredged sediment will be pumped to the Daisy Field Staging Area adjac Leverett Pond (See Sheet 2-20). This staging area will be located at the northe the grassy field at the southeast edge of Leverett Pond. The softball field will accessible to the public during operations but the little league field to the sou remain in use and will be separated from the staging area by a fence. Trucks access the staging area from Willow Pond Road and along the gravel pathwa Dredging equipment will enter the pond directly from the staging area.

A sedimentation basin, formed by overdredging, is also recommended in Le Pond as a treatment control BMP. The sedimentation basin would provide ac channel capacity for re-sedimentation when it does occur. The total amount c sediment that is to be overdredged in Leverett Pond is 2063 cubic yards and on the Preliminary Design Plans at the end of this Appendix.

2.4.2 Leverett Pond Historic Treatment

Treatment at Leverett Pond will include:

- Restore two historic islands by removing invasive species and replanting t the Primary Period of Significance. Restore the third island by reshaping a planting. The goal for this third island will be to replicate the two historic including their inaccessibility to the public thus providing safe wildlife ha Olmsted plant lists will be utilized for plant selection.

- Restore flow through the Babbling Brook that connects Leverett Pond and Pond.

- Refer to Preliminary Design Plans L-37 to L-43 in Appendix A for propose treatment in the Leverett Pond area.

2.4.3 Invasive Species Removal and Mitigation Planting

Removal of invasive vegetation will be performed during dredging operatio original shoreline, landscape and grading will be restored to the Primary Pe Significance. The work will include wetland planting, bank planting and upl planting of both shrub and tree layers to improve wildlife habitat and to hist restore the landscape. Turf covered banks will include a wetland edge to im wildlife habitat and lawn on banks and upland to restore the original histori viewsheds. At Leverett Pond the restoration of the historic turf covered bank northeast side of the Pond will require restoration of an historic path to re-es pedestrian access to the turf covered banks in keeping with the Primary Peri Olmsted plant lists will be utilized for plant selection. (See Appendix D). In t locations adjacent to the sedimentation basins, the plantings with wetland e be replaced with a mat and non-wetland plantings. These locations are limit number and width.

2.5 Willow Pond

2.5.1 Dredging

Willow Pond is approximately 3 ft. deep in some areas. The pond will be dredged by hydraulic methods. Approximately 6 ft. of sediment will be removed from the entire footprint of the pond and an additional 2 ft. will be dredged near the discharge point of the Chestnut Street drain. This will result in approximately 5,900 c.y. of sediment. The results of analysis will require that the sediment be disposed of in an out of state landfill. The sediment that is dredged from Willow Pond will be pumped to the Daisy Field Staging Area for dewatering and transport to the landfill. A pipe for pumping sediment will run from the east side of Willow Pond, across Willow Pond Road and along the gravel path to the staging area. The barge will access Willow Pond from the west side.

2.5.2 Willow Pond Historic Treatment

Activities that are proposed in the Willow Pond area include:

- Enhancement of the habitat of the three-spine stickleback,
- The repair of the rock dam between Spring Pond and Willow Pond,

Treatment for Willow Pond will include:

- Restoring the culvert bridge with pudding stone "teeth" and rock bank (waterfall) from Spring Pond into Willow Pond to reflect the Primary Period of Significance.
- Resetting stones in the Babbling Brook from Wards Pond to Willow Pond and the small waterfall under the pedestrian bridge on the upstream side of the Pond to reflect the Primary Period of Significance.
- Refer to Preliminary Design Plans L-44 to L-47 in Appendix A for proposed treatment in the Willow Pond area.

2.5.3 Mitigation and Historic Planting

The original shoreline at Willow Pond will be restored and the area will be landscaped and graded to match , the Primary Period of Significance. Work will include wetland planting, bank planting and upland planting of both shrub and tree layers to improve wildlife habitat and to historically restore the landscape. Turf covered banks will include a wetland edge to improve wildlife habitat and lawn on banks and upland to restore the original historic viewsheds. At Willow Pond the restoration of the historic turf covered banks on the northeast side of the Pond will require restoration of an historic path connecting Willow Pond to Willow Pond Road. The Olmsted plant lists will be utilized for plant selection. (See Appendix D).

2.6 Wards Pond

2.6.1 Dredging

The sediment in Wards Pond will be dredged using hydraulic dredging met Approximately 4 ft. of sediment will be dredged from the entire footprint of This will result in approximately 15,600 c.y. of sediment. Approximately 9,3 dredged from the middle section of the pond may be disposed of in an in-sta unlined landfill and about 3,100 c.y. dredged from the western part of the po be disposed of in an in state lined landfill. Approximately 1,600 c.y. from the southeast part of the pond will be disposed of in an out-of-state landfill and 1,600 c.y. of sediment that will be dredged from north end of the pond will b disposed of in a RCRA landfill. For purposes of pricing we have assumed th sediment that is chemically suitable for disposal at in-state unlined landfills disposed at out-of-state lined landfills. Our experience has been that the phy conditions of the sediment (percent moisture and percentage of fine materia likely to cause the unlined landfills to reject the material thereby requiring a alternate disposal site. Limits of sediment designated for each disposal area included on the design drawings based on information in Appendix C. The that is dredged from Wards Pond will be pumped to the Daisy Field staging dewatering. A pipe for pumping sediment will run from the north end of W Pond, through the surrounding woods along the gravel foot path. It will be j the pipe coming from Willow Pond at the east side of Willow Pond.

Based on the estimated quantities of sediment that will be dredged from the ponds, the length of operations in this area including mobilization, dredging dewatering and disposal will be approximately 9 to 12 months.

2.6.2 Historic and Mitigation Planting

After dredging and invasive species removal (Japanese Knotweed and Wate is complete, the original shoreline and grading will be restored to the Prima of Significance in areas disturbed during construction. Stabilization of banks dredging and rehabilitation of the landscape will include both plant massin construction of turf covered banks to reflect the Primary Period of Significa Planting in disturbed areas will include wetland planting, bank planting an planting of both shrub and tree layers to improve wildlife habitat and to res landscape historically. Three turf-covered banks were designed by Olmsted provide important viewsheds of and within the Pond. Planting of these turf banks will include a wetland edge to improve wildlife habitat and lawn on upland to restore the original historic viewsheds. The Olmsted plant lists w utilized for plant selection. (See Appendix D).

2.7 Erosion Control Measures

During dredging activities, care will be taken to minimize erosion and sedimentation along the river and at the staging areas. Using hydraulic dredging methods will minimize re-suspension of sediment because the water serves as the transport medium for sediment and is pumped through the pipeline to the staging area. In addition, the dredge can be fitted with a hood near the cutter head that keeps re-suspended sediment close to the dredge. Where excavators are used, silt curtains and oil absorbent booms will be placed in the river to contain sediment.

Staging areas will be surrounded by silt fences and hay bales to minimize erosion through runoff. In addition, the Contractor will place a gravel layer over the staging area to minimize erosion of existing soil. Return water from the belt filter presses will be discharged to the river within a silt curtain.

2.8 Construction Sequencing

Dredging will be performed in two segments. The first will be the Charlesgate area and the second will be from Back Bay Fens Upstream to Wards Pond. Culvert construction and daylighting will be completed after dredging because these areas are needed for staging areas. Dredging cannot be performed during weather that is cold enough to freeze the water because it affects the dewatering process.

Section 3
Design Development Considerations

3.1 Civil

3.1.1 Overflow Capability to the Muddy River Conduit

In the area of Brookline Avenue there are several design considerations that require specific recognition. The first of these design considerations is the connection to the Muddy River Conduit. Currently, The Muddy River flows through the two buried 72-in. drain lines located in the Former Sears Parking Lot and discharges underground into the existing Brookline Avenue Gatehouse substructure. Flow from the Muddy River enters the substructure and partially diverges into a 9-ft by 11-ft Muddy River Conduit while the rest continues on its course through a 7-ft by 9-ft conduit. The Muddy River Conduit travels down Brookline Avenue and discharges directly into the Charles River. The 7-ft by 9-ft conduit transitions into twin 72-in. diameter drains, discharging flow into a segment of the Muddy River called the Upper Fens Pond.

There is a rectangular shaped butterfly valve within the Brookline Gatehouse substructure that is located where it can control flow to the Muddy River Conduit. The valve is currently in the open position creating a 50/50 split in flow between the Conduit and the Muddy River. The valve has been designed to also act as a weir when closed. There is space above the valve that allows for water to overtop and spill into the Conduit. This weir has the capacity to provide relief to the Muddy River System during heavy rainfall events. Hydraulic and hydrologic modeling has shown that relief during heavy rainfall events is required at this location. As a result, this overflow capability cannot be eliminated. Under proposed conditions, the valve will remain closed sending the full flow down the Muddy River except during heavy storm events where the system will top the valve and overflow into the Muddy River Conduit.

To ensure there is a hydraulic relief at this location during large storm events, four options were investigated.

1. The first option consists of uncovering the upstream face of the Gatehouse. What is known today as the Former Sears Parking Lot was once a natural channel that entered the Brookline Gatehouse through three large rectangular shaped openings. Years later, the Gatehouse was removed leaving only the substructure. The natural channel was replaced with two 72-in. pipes and covered with fill material. This project is proposing to restore the original natural channel, daylighting again the Former Sears Parking Lot. The construction of the open channel will extend to the edge of the Gatehouse, uncovering one side of the substructure. This will leave the upstream face exposed and visible. In order to continue overflow ability to the Muddy River Conduit, the original openings on the face of the substructure will need to be re-established. There are problems with this alternative since it will leave the old concrete facing of the gatehouse exposed to view. This was considered to be somewhat unsightly and not aesthetically pleasing to view from the pathways

around the new day-lighted area in the Former Sears Parking Lot especia
is not part of the former superstructure.

In addition, it was felt that the openings would be considered a danger t
If water entered the Gatehouse through the openings, a person could pot
enter and get trapped inside the 9-ft by 11-ft Muddy River Conduit, whic
pipeline that has no access downstream until it reaches the Charles River
flowing through this opening and into the butterfly valve would also be
maintenance problem. An option to help solve the safety and debris issu
to reconstruct the face of the Gatehouse and place the openings of the Ga
substructure just below average daily water surface elevation. See Sheet
water could pass through the newly submerged openings, enter into the
substructure, and overtop the closed weir. This wall would prevent any
debris from entering into the gatehouse substructure.

A sub-option would be to install coarse bar racks on the upstream face o
gatehouse to help prevent people from entering and to keep out debris.
racks would have to be installed at an angle with provisions to clean and
them. This option over time would be more costly due to the continuous
maintenance required.

2. A second option is to not uncover the upstream face of the Gatehouse an
   allow overflow to enter the substructure through the existing 72-in. drai
   downstream side of the Gatehouse. In this option the 72-in. drains upstr
   gatehouse would be removed and the openings in the gatehouse would
   This option would work as follows: During heavy rainfall storm events,
   flow in the reverse direction, up the 72-in. drains starting at the Fens Por
   7-ft by 9-ft Conduit and then to the Gatehouse where it will then spill ov
   the closed valve. This will allow for the required relief by drafting the flo
   downstream hydraulic grade line. Under this option, special care will ne
   taken when constructing the downstream headwall for the new arched c
   Brookline Avenue in order to incorporate, maintain and protect from da
   existing drains that flow from the Gatehouse structure. There were some
   concerns with this alternative since it requires the flow to travel over a lo
   through old pipe with a higher potential of sedimentation. This option w
   require a more detailed analysis of the condition of the existing piping.

3. A third option for providing overflow capability to the Gatehouse is to l
   section of the 72-in. drains upstream of the gatehouse in place and const
   separate headwall with bar racks over them. The gatehouse face would
   covered. The new headwall and bar racks would be visible. Visibility of
   headwalls was considered to be somewhat unsightly and not aesthetical
   with the historical design or the view from the pathways around the ne
   lighted area in the Former Sears Parking Lot. This option was proposed
   Corps of Engineers. See Sheet 3-2.

4. The fourth option investigated consists of constructing a short conduit from the new arch culvert directly to the Gatehouse. See Sheet 3-3. This is a direct connection to the gatehouse and cuts down on the travel route of the diverted flow. With the entrance inside the arch culvert there will be no visibility issues. A bar rack would be required for safety and will help keep debris from entering the gatehouse substructure, however the top of the overflow pipe could be submerged, negating the need for bar racks. This option allows the upstream face of the Gatehouse to remain covered. In addition, the existing 7′x9′ Conduits downstream of the Gatehouse under Brookline Avenue can be abandoned. This is the preferred alternative.

   The size of the pipe connection is estimated to be 60-in. and will be confirmed when a more detailed investigation of the Gatehouse is made during final design. The actual condition and layout inside the structure may cause the pipe diameter to vary. In addition, during final design, other modifications to the Gatehouse will be evaluated. If the condition of the structure is shown to not be capable of modifications, the recommended alternative may consist of removing a large portion of the structure and extending the pipe connection to the butterfly valve chamber of the Gatehouse.

3.1.2 Water Main Crossing

There is a Boston Water & Sewer 48-in. water main in Brookline Avenue that conflicts in elevation with the 10′x24′ new arch culvert being proposed. Four options for relocating this water main were investigated.

1. The first option is to direct bury a new 48-in. water main under the new arch culvert. The water main would be cast in concrete where it crosses under the proposed arch culvert. The concrete encased pipe would also be supported on piles. The drawback to encasing the pipe in concrete is that the main will not be accessible. As an alternative to concrete encasement, the main could be installed inside a steel casement pipe. The main would be ductile iron and slipped inside the casing using wooden blocking. The steel casing would also be supported on piles. Steel sheeting for trench support will be necessary during the construction of the water main. The sheeting on both sides will be left in place leaving relatively easy access at each end of the casing in case the ductile iron pipe needs replacement in the future. See Sheet 3-4.

2. The second option is to relocate the main over the arch culvert. Since there would not be adequate cover over the new water main if it was raised higher, the pipe under this option will have to extend partially into the new culvert. The new ductile iron water main will need to be insulated, set inside a steel casing, and then encased in concrete. See Sheet 3-5. The extension into the culvert could be as much as 2.5 feet. This encroachment will cause additional head-loss within the

culvert, however, the head-loss would be minimal. This option provides a cost savings compared to the other options.

3. The third option consists of installing a pre-cast concrete pipe chase of suf dimensions to be able to access and work on the new 48-in. water main. A preliminary sizing shows the pipe chase would be 6-ft in high by 10-ft wid pipe chase would be water tight with provisions to pump water out of it f access. This option wasn't investigated any further since the cost would fa the other options. It was also felt that the steel casing included in Section 3 would be adequate for future maintenance concerns.

4. The fourth option is to relocate the water main towards the upstream end culvert in an area out of the roadway where the ground surface could be mounded. If the ground is mounded 2-4 feet and the pipe is insulated, thi provide sufficient cover over the pipe to prevent any future freezing of th during cold periods and allows for the pipe to get over the arch culvert. Se 3-6. This option is costly since there is a significant increase in piping and required.

Placing the water main in a steel encasement as described in Section 3.2.1 is th preferred alternative. This option provides an adequate relocation that is som accessible for future repairs, provides the best protection from future freezing also eliminates any encroachment in the passageway that the arch culvert pro the Muddy River. It is not the least costly option but it is believed to be the m secure taking into consideration all the issues.

3.1.3 Storm Drain Connections

There are two existing storm drains will need to be diverted fully to the Mud These drains referred to as the Emmanuel College Drains currently travel dov Brookline Avenue, cut through the top of the 7-ft by 9-ft conduit that leaves th Gatehouse, and empty into the Muddy River Conduit. The drains are 45-in. d brick and 51-in. by 51-in. brick. These drains pick up storm runoff from the C grounds and transports the flow to the Muddy River Conduit. When the new culvert is constructed in Brookline Avenue, these drains will be combined by discharging into a below grade drainage structure next to the new arch culve the drainage structure a new 60-in. drain will be installed and will discharge side of the arch culvert. See Sheet 3-7. According to BWSC, these drains are n combined sewers and therefore will not cause any water quality issues by dis them into the new culvert. Hydrologic and hydraulic modeling indicates ther very little impact on the hydraulics of the Muddy River with the addition of t drains during heavy storms. There is also an indication that diverting these d will help with existing problems downstream in the Muddy Rivers Conduit.

An alternative to discharging directly into the new arch culvert would be to construct nverted siphons on each drain line under the arch culvert and to reconnect to the existing drains downstream of the culvert. This option would not increase flows to the Muddy River. Construction of siphons is very costly and also requires an intensive O&M plan. Due to the high cost associated with maintaining siphons, this option was eliminated. Also, as mentioned, the hydrologic and hydraulic investigation indicates that the Muddy River can handle the additional flow if it is diverted.

3.2 Structural

3.2.1 Arch Culvert Foundation Design

Arch culverts can achieve greater spans with thinner sections than conventional box culverts due to the inherent efficiency of the arch shape. In this case, the vertical loads generate internal forces in the structure that are predominantly compressive (rather than flexural), taking advantage of concrete's high compressive strength. The culvert is also designed utilizing a soil-structure interaction analysis, which takes into account the lateral soil pressure on the sides of the culvert to support the vertical loads on top. When supported on soil, cast-in-place or precast concrete footings can be used beneath. The use of pile foundations will necessitate the use of cast-in-place concrete pile caps, as an effective connection of the precast arch units to the piles is not considered feasible.

Unlike box culverts, the foundations of an arch culvert are required to provide lateral reactions at the base of the wall, in order to keep the bases from "spreading" due to the lateral thrusts developed by use of the arch configuration. When supported on soil, these lateral reactions are provided by a combination of passive soil pressure and friction acting on the side and base of the footing, respectively. When pile foundations are provided, these reactions can often be provided by the piles, depending upon soil conditions and pile type. Where the piles cannot provide sufficient resistance to the lateral loads, a tension "tie" (in the form of a continuous slab or intermittent struts) can be used, since the reactions at the bases are generally equal and opposite. Based on the preliminary analyses of the proposed cross-sections, if appears that sufficient lateral reactions at the base of the culvert can be provided by the piles.

Headwalls for the arch culverts are often supplied as precast units, founded on cast-in-place or precast concrete footings. In this case, given the irregular geometries required to match existing conditions, construction around existing structures, and the need for pile supported foundations, the headwalls will be cast-in-place concrete walls and footings supported on piles.

3.2.2 Inspection of Existing Structures

Although buried concrete and masonry structures, particularly those in a wet environment, tend to be relatively resistant to deterioration and decay, various mechanisms can result in their degradation. This is particularly likely with relatively old structures (greater than 50 years), since they become susceptible to deteriorating agents in the groundwater and soil that only manifest deterioration over a lo of time. Given the age to the structures to be reused as part of the restoration, inspection and evaluation of them as part of the final design is recommended

Where structures are accessible or can be dewatered, an inspection should be conducted by a structural engineer. Where dewatering not possible, an inspe should be performed by a diver with video transmission monitored by a stru engineer. Below-grade portions of structures should also be inspected by the of local test pits at selected areas. Where test pits are performed, the surfaces pressure washed to remove dirt and laitance, exposing the parent material.

Inspections are proposed for the following existing structures and specific are total of five test pits are recommended. Exact locations would be established field.

- Twin 72-in. drains below the Riverway. Perform an internal inspection of t by diver. Excavate one test pit to view the connection to the existing inlet s to the west of the Riverway, and one to view the proposed area of connecti new headwall to the east.

- Substructure of the Brookline Avenue Gatehouse. Inspect the top slab and of the interior visible through the hatches. Perform an internal inspection b Excavate a test pit to view the connection of the existing twin 72-in. culvert west. Although the connection of the gatehouse to the existing Muddy Riv Conduit will be utilized as an overflow as part of the restoration, inspectio considered necessary since that portion of the culvert is only several years

- Culvert beneath Avenue Louis Pasteur. Inspect the headwalls and visible p of the structure. Perform an internal inspection of the culvert and the existi 72-in. drain connection structure by diver. Excavate one test pit to view the connection of the existing twin 72-in. culverts on the west side of the avenu one to view the top and sides of the brick culvert itself on the east side.

The inspections would consist of an initial assessment followed by more exha sampling and testing, if required. The initial assessment would be performed accessible surfaces of the structures, as follows.

- Perform a visual observation of the surface to assess the general condition material and identify deteriorated areas. Examine structures for evidence distortion, settlement, or other evidence of overstress. Concrete members generally inspected for cracks, spalls, scaling (loss of surface mortar), erosi disintegration. Stone or brick masonry will be generally inspected for loos eroded units, cracks, and recession of mortar.

- Where surfaces are accessible and dewatered, perform a hammer soundin dragging to detect voids, delaminations, or other subsurface deterioration

- Probe deteriorated areas to determine the depth and extent of the deteriorations, and the presence of sound material. Use feeler gauges or comparometers to establish minute crack widths.

- Survey, photograph and plot patterns of significant deteriorations for further analysis.

Based the observations of the initial assessment, additional material sampling and testing of the existing structures may be recommended. Although specific techniques used would be dependent upon the type of deterioration encountered in the visual investigation, they would most likely involve obtaining drilled 4-in. or 6-in. core samples for chemical and physical testing, and petrographic examination.

3.3 Geotechnical Considerations

3.3.1 Purpose and Scope

The purposed of this study was to investigate the subsurface conditions along the proposed culvert and open channel alignments and provide preliminary geotechnical engineering recommendations for the design and construction of the culverts and open channels. Specifically, the scope of work included the following:

- drill a total of eleven (11) test borings at Sites 1 through 5 for the purpose of gathering information on the subsurface conditions and to obtain soil samples for laboratory testing,

- conduct laboratory tests to assist with classification of soils encountered and to determine the strength and compression properties of the underlying strata,

- develop preliminary geotechnical recommendations for design and construction of the proposed culverts and open channels, and

- prepare this memorandum presenting CDM Jessberger's recommendations, including the data collected as part of the investigation.

3.3.2 Existing Site Conditions

Beginning at the Riverway crossing, the Muddy River travels through a series of enclosed culverts and open channels for approximately 1.7 miles, eventually discharging under Storrow Drive into the Charles River. Our understanding of existing buried structures in the area of the five sites are described below:

- Site 1 - Approximately 200 lin. ft. of twin 72-in. diameter concrete pipes are located under the intersection of Park Drive and Riverway. The pipes extend from a headwall adjacent to Riverway and extend under the intersection of Riverway and Park Drive into the Former Sears Parking Lot. Available drawings indicate that the headwall is supported on pile foundations.

- Site 2 - Approximately 320 lin. ft. of twin 72-in. diameter concrete pipes are under the Former Sears Parking lot. The pipes extend from the intersection Riverway and Park Drive to the Brookline Ave Gatehouse. Available draw indicate that the gatehouse is supported on timber piles. The remains of an abandoned bridge foundation supported on pile foundations may be prese within the Former Sear Parking lot.

- Site 3 - Approximately 140 lin. ft. of a 7 ft. by 9 ft. box culvert connects to 2 of twin 72-in. diameter concrete pipes located under Brookline Ave. The tw diameter concrete pipes extend from the Brookline Ave Gatehouse to an o channel south of Brookline Ave. A 9 ft. by 11 ft. box culvert, extending fro Gatehouse, connects to a 45-in. diameter brick drain and a 51-in. diameter drain which run south along Brookline Ave. Available drawings indicate t ft. by 11 ft. culvert and 51-in. concrete drain are supported on pile foundat

- Site 4 - Approximately 360 lin. ft. of twin 72-in. diameter concrete pipes are under an open grass lot parallel to Park Drive. The pipes extend from an o channel to a concrete encasement that connects the twin pipes to an arch c

- Site 5 - Approximately 70 lin. ft. of a 16.5 ft. wide arch culvert is located un Louis Pasteur Ave. The arch culvert extends from the concrete encasement headwall. Available drawings indicate that the head wall is supported on t piles.

3.3.3 Subsurface Explorations

Previous Explorations

Records of test borings drilled previously at the site are provided by the Bost Society of Civil Engineers (BSCE) in a paper entitled "Boring Data from Grea Boston, Section 2: Roxbury," Journal of the BSCE, Vol. 57, No. 3, July 1970. Ba the data presented in this paper, the site is generally underlain by the followi beginning at ground surface:

- Miscellaneous Fill (about 5 to 20 ft. thick),

- Organic Silt and or Peat (about 10 to 30 ft. thick),

- Silt or Sand (about 5 to 70 ft. thick),

- Marine Clay (about 55 to 145 ft. thick),

- Glacial Till (about 10 to 40 ft. thick), and

- Bedrock.

Recent Explorations

To further evaluate the subsurface conditions along the proposed culvert and open channel alignments, Geoteck Engineering, Inc. of Framingham, MA drilled eleven (11) test borings (SPL-SB1 through SPL-SB7 and EC-SB1 through EC-SB4) for CDM from July 17, 2000 to August 1, 2000.

The test borings were drilled using a truck mounted drill rig and hollow stem augers. Split spoon sampling was conducted at approximately 5 ft. intervals within the overburden soils. The samples were collected according to ASTM D-1586 (2-in. diameter split spoon sampler driven 24 in. by blows from a 140-pound hammer falling freely for 30-in.). The number of blows required to drive the sampler each 6-in. increment was recorded and the Standard Penetration Resistance (SPT) N-value was determined as the sum of the blows over the middle 12-in. of penetration. Representative soil samples from each split spoon were collected and stored in jars for subsequent review and laboratory testing. Two undisturbed tube samples were collected in accordance with ASTM D-1587 from the Marine Clay strata.

Boring locations were field located prior to drilling by taping from existing site features. The explorations were drilled as close as practical to the staked locations. Approximate locations of the explorations are shown on Figures 2-1 through 2-5.

Test boring logs were prepared and reviewed by CDM and are attached in Attachment A. A summary of the subsurface conditions encountered in the recent explorations is included in **Table 3-1**.

3.3.4 Soil and Groundwater Conditions

Soil Conditions

Test borings drilled along the proposed culvert and open channel alignments encountered subsurface conditions that are generally consistent with those discussed above. A more detailed description of the conditions encountered in the recent explorations follows.

All test borings encountered a layer of Miscellaneous FILL that typically consists of loose to dense SAND and GRAVEL, some silt, trace clay, brick. At test boring locations, the fill thickness varied from approximately 9 to 20 ft. Obstructions were encountered in the fill layer at depths of 9.4 ft, 12 ft, and 16.5 ft. in test borings SPL-SB1, EC-SB2, and EC-SB2B, respectively. As a result of these obstructions, the test borings were relocated and redrilled.

The fill is underlain by a thick layer of soft gray ORGANIC SILT and/or soft black PEAT. The organic silt layer was encountered in all the test borings and varied from approximately 9 to 20 ft. thick. Peat was encountered in two of the test borings and ranged in thickness from approximately 6 to 8 ft. thick. SPT N-values in the organic silt ranged from WOH to 12 bl/ft in the recent explorations. WOH indicates that the split spoon was advanced using just the weight of the hammer without any impact or

SUMMARY OF SUBSURFACE EXPLORATIONS

TABLE 3-1

Test Boring Number	Approximate Ground Surface EL	Total Drilling Depth (ft)	Soil Strata Thickness (ft)						Approximate Depth to Groundwater (ft)	Comment
			Fill	Organic Silt	Peat	Silt & Sand	Marine Clay	Sand & Gravel		
SPL-SB-1	18	9.4	9.4	NE	NE	NE	NE	NE	NE	Refusal at 9 ft.
SPL-SB-1A	18	59	19	10	NE	NE	NE	>30	8	
SPL-SB-2	20	43	13	18	1	NE	11	NE	9	Refusal at 43 ft.
SPL-SB-3	15	51	14	15	NE	10	>12	NE	7	
SPL-SB-4	17	51	19	9	NE	4	>19	NE	7	
SPL-SB-5	18	56	12	4 / 5	8	NE	>27	NE	10	
SPL-SB-6	17	56	14	15	NE	4	>23	NE	10	
SPL-SB-7	17	56	9	10	6	4	>27	NE	7	
EC-SB-1	15	51	14	9	NE	2 / 4	>22	NE	8	
EC-SB-2	16	12	>12	NE	NE	NE	NE	NE	9	Refusal at 12 ft.
EC-SB-2A	16	10	>10	NE	NE	NE	NE	NE	9	Refusal at 10 ft.
EC-SB-2B	16	16.5	>16.5	NE	NE	NE	NE	NE	9	efusal at 16.5 ft.
EC-SB-2C	16	46	20	10	NE	6	>10	NE	9	
EC-SB-3	18	73	9	5 / 19	NE	3	> 37	NE	9	
EC-SB-4	20	76	20	19	NE	NE	>37	NE	5	

Notes:

1. All elevations are reported in feet and referenced to NGVD Datum.

Abbreviations:

NE	Not Encountered
>	Indicates strata not fully penetrated
/	Indicates strata is discontinuous

driving of the hammer, i.e., 0 bl/ft. SPT N-values in the peat ranged from 3 to 11 bl/ft in the recent explorations.

A layer of very stiff, green-gray SILT, some clay to medium dense, gray fine SAND, some gravel is occasionally interlain with or underlies the organic silt and peat strata. This layer was encountered in six of the recent test borings and ranged from 3 to 7 ft. thick at boring locations. SPT N-values in the silt and sand strata ranged from 13 to 41 bl/ft in the recent explorations.

Marine clay was encountered in ten of the eleven recent test borings. The clay stratum typically consists of a layer of stiff gray CLAY (crust layer) overlying a medium stiff blue-gray CLAY (Boston blue clay). The total thickness of the marine clay varied from at least 10 ft. up to 36.5 ft. thick at exploration locations. The crust layer varied from about 8 to 28 ft. thick at exploration locations. SPT N-values in the clay crust ranged from 9 to 37 bl/ft. and 5 to 19 bl/ft. in the remainder of the marine clay strata in the recent explorations.

A layer of medium to very dense, gray fine SAND and GRAVEL was encountered in two of the test borings. This strata was encountered below the marine clay layer in test boring EC-SB3 and directly below the organic silt layer in test boring SPL-SB1A. SPT N-values in the sand and gravel ranged from 14 to over 100 bl/ft.

None of the recent explorations extended to bedrock.

Groundwater Levels

Ground water levels measured in the exploration ranged from 4 to 10 ft. below ground surface, El. 16 to El. 7. The water level in the river at the time of explorations was at approximately El. 8, which is considered to be the typical water level for the river.

Groundwater levels measured in the explorations should not necessarily be considered to represent stabilized groundwater levels. In addition, water levels are expected to fluctuate with season, temperature, climate, construction in the area, and other factors. Actual conditions encountered during construction may be different from those observed at the time of the exploration.

Variation in Subsurface Conditions

Interpretation of general subsurface conditions presented herein is based on soil and groundwater conditions observed at the test boring locations. However, subsurface conditions may vary between exploration locations. If during construction conditions are found to be different than assumed, recommendations contained in this report should be reevaluated by CDM and confirmed in writing.

Laboratory Testing

Laboratory tests were performed on select split spoon samples from the fill,
silt , peat, sand and gravel, and clay strata collected at the site to determine
Limit, organic content, grain size distribution, and water content. In additio
Unconsolidated Undrained (UU) triaxial compression test were preformed o
undisturbed tube samples collected from the marine clay layer.

A summary of the laboratory test results is presented in **Table 3-2**. Individu
results are included in Attachment B.

3.3.5 Proposed Restorations

The proposed restoration will involve the portion of the river, which extend
approximately between the Riverway and Ave Louis Pasteur. The project ar
been separated into five sub-areas, which are designated as Site 1 through S
Proposed restorations at each of the sites is as follows:

- Site 1 - Construct approximately 200 lin. ft. of a 10-ft by 16-ft arch culvert
below Riverway. Maintain existing twin 72-in. diameter culverts.

- Site 2 - Replace approximately 320 lin. ft. of twin existing 72-in. diameter
with an open channel between Riverway and Brookline Ave in the Forme
Parking Lot. The new open channel will end at the Brookline Gate House.
existing culverts will be removed.

- Site 3 - Construct approximately 340 lin. ft. of 10 ft. by 24 ft arch culvert lo
below Brookline Ave. The existing 7 ft. by 9 ft. culvert and twin 72-in. dia
culverts will not be removed.

- Site 4 - Replace approximately 360 lin. ft. of existing twin 72-in. diameter
with an open channel located west of Park Dr/Fenway and adjacent to En
College.

- Site 5 - Repair as needed the existing arch culvert under the intersection o
Drive and Louis Pasteur Avenue. Dredging of the sediments in the culver
planned to increase flow capacity.

New headwalls will be constructed at most sites.

Refer to Figures 2-1 through 2-5 for site plans of the proposed restorations.

3.3.6 Geotechnical Design Recommendations

Foundation Recommendations

The bottom of the proposed culverts and headwalls at Sites 1 and 3 are expe
at about El. 2 which is approximately at the top of the organic silt and peat l

Muddy River Restoration Project
Boston Parks & Recreation Department
Boston, Massachusetts

SUMMARY OF LABORATORY TEST RESULTS
TABLE 3-2

Sample Number	Sample Depth (ft)	Strata	Organic Content %	Water Content %	Atterberg Limits (%)			Undrained Shear Strength (psf)
					LL	PL	PI	
S-6	24-26	Organic Silt	9.9	56.2				
S-9	39-41	Sand & Gravel		16.3				
S-6A	24-25	Peat	19.1	134.1				
S-7	29-31	Organic Silt	12.7	91.9				
U-9	39-41	Clay (crust)		24				1596
S-10	41-42	Clay (Boston Blue)		21.2	25	14	11	
S-2	4-6	Fill		2.2				
S-6	24-26	Organic Silt	3.4	48.5				
S-7	29-31	Clay (crust)		24.5	35	18	17	
S-2	4-6	Fill		10.1				
S-6	24-26	Organic Silt	2.7	44.9				
S-7	29-31	Clay (crust)		12				
S-5	19-21	Fill	13.2	82.4				
S-6	24-26	Organic Silt	0.4	21.6				
S-8	34-36	Clay (crust)		26.4	35	19	16	
S-10	44-46	Clay (Boston Blue)		25.5	36	19	17	
S-7	29-31	Silt		23.1	36	20	16	
S-12	54-56	Clay (Boston Blue)		28	44	21	23	
S-3	9-11	Peat	20.5	129.7				
S-4	14-16	Sand & Gravel		8.5				
S-7	29-31	Clay (crust)		26.2	39	21	18	
S-2	4-6	Fill		5.9				
S-3	9-11	Sand & Gravel		6.5				
S-5	19-21	Organic Silt	2	32.2				
S-4	14-16	Sand & Gravel		10				
S-6	24-26	Organic Silt	4.1	55.1				
S-10	44-46	Clay (crust)		28.7	44	22	22	
U-16	69-71	Clay (Boston Blue)		26.5				492
S-17	71-73	Clay (Boston Blue)		20.3	NP	NP	NP	
S-3	9-11	Fill		2				
S-8	34-36	Organic Silt	6.6	64.2				
S-11	49-51	Clay (crust)		22	38	20	18	
S-14	64-66	Clay (Boston Blue)		32.8	32	17	15	

Tests for organic and water contents were performed in accordance with ASTM D2974.
Atterberg Limit tests were performed in accordance with ASATM D4318.
Tests for undraind shear strength were performed in accordance with ASTM D2850.

ns:
Non Plastic

These soils are not considered suitable for foundation support due to the low strength, high compression, and creep properties of these types of soils. If supported on these soils the proposed culverts could settle several feet over time with most of the settlement occurring with the first few years after construction and the remainder of the settlement occurring as long term creep settlement for many years after construction.

Culvert installation using pipe jacking methods does not appear practical for several reasons including;

- large culvert opening size and potential difficulty in stabilizing the open face through the existing miscellaneous fill soils,
- shallow soil cover over the top of the culvert and potential for loss of ground into the face of the excavation,
- potential to encountered abandoned buried foundations or other obstructions,
- poor soil conditions at the base of the proposed culverts which will not provide adequate foundation support for the structures, will likely cause alignment control problems during jacking, and will provide little resistance for the required thrust block at the jacking shaft locations.

Several feasible foundation support options for the proposed culverts and headwalls include the following:

- *Excavation/Replacement Between Two Rows of Sheeting* - Install two rows of steel sheeting, one on each side of the proposed culvert alignment, excavate all the organic silt and peat soils from between the sheeting and replace with compacted granular fill. The structures can then be supported on the compacted fill.
- *Grouting* - Grout the entire organic silt and peat deposit located directly below the culvert alignments and thus increase the strength and reduce the compressibility of these strata. Once grouted, the grout-soil mass will be suitable for foundation support and the structures can then be supported directly on it. Alternatively, it may be possible to reduce the volume of soil that must be grouted by support the structures on discreet grout columns that extend through the organic silt and peat strata into the clay crust or sand strata below.
- *Pile Foundations* - Support the culverts on pile foundations installed through the organic silt and peat strata and into the underlying marine clay or sand and gravel strata. The piles should be designed as friction piles with allowable adhesion values of 500 psf in the Boston blue clay and 1,000 psf in the clay crust or sand and gravel layer. Timber piles or drilled-in-mini piles appear to be the most practical pile types for use at the site. A maximum design load of 22 tons should be used for timber piles. Drilled-in-mini piles can accommodate higher loads.

The preferred foundation support option will be selected during final desigr Selection will be based on factors such as constructability and cost.

Open Channel Recommendations

New open channels should be designed for maximum side slopes of 3 horizc vertical (3H:1V). Flatter side slopes may be required in areas where the botto channel will be in soft soils.

Erosion control consisting of rip-rap or erosion control mats should be provi portions of the channel located below the water level.

3.4 Landscape Architecture

3.4.1 Treatment of Landscape and Historic Resources

3.4.1.1 Charlesgate Area

The existing site has minimal historical resources or integrity for either the P Secondary Periods of Significance. Nothing remains from the Olmsted Perio (Primary) and the balustrade areas are the only features that remain from th Period (Secondary). The existing landscape dates from 1964 and was constru part of the Bowker Overpass. Treatment will be in keeping with Olmsted pri and will utilize the same types of plantings.

Treatment at Charlesgate will include stabilization of banks after dredging; s repair in kind of existing riprap bank and restoration of landscape in staging truck lay-down area. Both the staging and lay-down areas are located under Bowker Overpass.

Refer to Preliminary Design Plan L-1 to L-3 for proposed treatment in Charle

3.4.1.2 Back Bay Fens

The existing site has historical resources with integrity from both the Primar Secondary Periods of Significance, but the Secondary Period has the greater extant. Documentation of this area will provide the needed information to re shoreline after dredging and removal of invasive plant material from the bar identify the extant features. Planting plans and plant lists are scant from the Period and have not been found for the Secondary Period. Since the Fens is c freshwater, we will utilize the plant lists for the Muddy River for Olmsted P the Riverway, but we will use plant massings from the historic plan docume rehabilitate the areas disturbed during this project.

Treatment at Back Bay Fens will include:

- After dredging is complete, the original shoreline will be restored to the Secondary Period of Significance for areas that were filled during the Shurtleff Period and will be preserved in areas that were not filled or modified by Shurtleff and therefore, still represent the shoreline extant from the Primary Period. Stabilization of banks after dredging will include plant massing to reflect the Primary and Secondary Periods of Significance. Planting will include wetland planting, bank planting and upland planting of both shrub and tree layers to improve wildlife habitat and to historically restore the landscape.

- Rehabilitation of the landscape, after removal and dredging of invasive materials on banks and over water, such as *Phragmites* and Purple Loosestrife, will include both plant massing and the construction of "beaches" to reflect both the Primary and Secondary Periods of Significance. Planting will include wetland planting, bank planting and upland planting of both shrub and tree layers to improve wildlife habitat and to historically restore the landscape. Beaches will include a wetland edge to improve wildlife habitat and lawn on banks and upland to restore the original historic viewsheds.

- After completion of the dredging, the staging area at the Agassiz Road site will be rehabilitated. At Agassiz Road existing trees to remain will be protected and pruned, some trees will be removed and replaced in kind, existing paths and sidewalks will be rehabilitated, and existing lawn areas will be restored. An existing desire line path, which has resulted in erosion of lawn areas, will be regraded and constructed as a new path to incorporate best management practices. The original Agassiz Road was a two-way road prior to the MDC design to one-way with a narrowed roadway and expanded lawn edges. To respect the continuum the road will remain one-way with its current narrowed roadway.

- After completion of the dredging, the staging area at the Lagoon area will be restored. Existing trees to remain will be protected and pruned, existing trees, lighting, and paths will be removed, and the area will be planted and paths constructed to restore the site to the Secondary Period of Significance. The 1926 Shurtleff Master Plan for this area was a lawn area, with extensive shrub planting, two east / west paths to two footbridges and a north/south cross path. The lagoon was a reflecting pool for the Museum of Fine Arts. The goal is to rehabilitate this area to reflect the Secondary Period of Significance.

- Under the issue of best management practices, several areas along the Fenway will be rehabilitated and paths and drainage patterns will be redesigned to prevent the siltation resulting from human disturbance and water runoff from the surrounding roadways. As an example, desire line paths from and to the Museum of Fine Arts need to be accommodated or redirected or controlled utilizing plantings. Rehabilitation will include lawns, plantings and pathways.

- After day lighting to increase flood-flow capacity between the Fens Bridge Brookline Avenue, the area will be restored and rehabilitated to reflect the Period of Significance. Complete grading plans for this area and plant ma shown on the 1921 Survey will allow for the restoration of the banks and t original island from the Primary Period. The island and the banks will be reconstructed to reflect these historic massings and to accommodate wildl island will not be accessible to the public, thus providing safe wildlife hab new culvert headwall at Brookline Avenue, the reconstruction of the Fens culvert headwall on the south side and the restoration of the north side cu headwall at the Fens Bridge will be completed with planting restoration to the Primary Period of Significance. Rehabilitation of the pedestrian and eq path system will be designed taking into consideration the land takings by MDC to accommodate widening of the roads, development of a turn by th at Brookline Avenue, and current circulation and crosswalks. Planting, lav path design will be included.

- After day lighting to increase flood-flow capacity between the Fenway and Brookline Avenue at the former Sears Parking Lot, the area will be restore rehabilitated to reflect the Primary Period of Significance. Complete gradi plant massing and view plans as well as planting plans will allow for the restoration of much of the banks and original shoreline of the Primary Per new culvert headwall at Brookline Avenue, the new culvert headwalls on and north sides of the Sears at the Fenway will be completed with plantin restoration. Rehabilitation of the pedestrian and equestrian path system w designed taking into consideration the removal of the historic bridge alon land takings by the MDC to accommodate widening of the roads, and the pedestrian and bicycle circulation and crosswalks. The actual area of park significantly reduced for road takings and the removal of the bridge ende access up the Muddy River from this point. Planting, lawn, path design ar crosswalk design will be included.

Refer to Preliminary Design Plan L-4 to L-23 for proposed treatment in Back

3.4.1.3 The Riverway

The existing site has extant historical resources with integrity from the Prima of Significance. Documentation of this area will provide the needed informat restore the shoreline after dredging and removal of invasive plant material f banks and to identify and to protect the extant features. Planting plans, grad viewshed design and plant lists are complete for the Primary Period and wil the information needed to rehabilitate the areas disturbed during this projec

Treatment in the Riverway will include:

- After dredging is complete, the original shoreline and grading will be restored to the Primary Period of Significance. Stabilization of banks will include plant massing and the construction of "beaches" to reflect the Primary Period of Significance. Planting will include wetland planting, bank planting and upland planting of both shrub and tree layers to improve wildlife habitat and to historically restore the landscape. Beaches will include a wetland edge to improve wildlife habitat and lawn on banks and upland to restore the original historic viewsheds. Primarily the Olmsted plant lists will be utilized for plant selection.

- Rehabilitation of the landscape, after removal of invasive materials on the banks and over water, such as *Phragmites* and Japanese Knotweed, will include both plant massing and the construction of "beaches" to reflect the Primary Period of Significance. The original shoreline and grading will also be restored to the Primary Period of Significance. Planting will include wetland planting, bank planting and upland planting of both shrub and tree layers to improve wildlife habitat and to historically restore the landscape. Beaches will include a wetland edge to improve wildlife habitat and lawn on banks and upland to restore the original historic viewsheds. The Olmsted plant lists will be utilized for plant selection.

- In the Riverway there are two existing islands just north of the pedestrian and equestrian bridges near the Longwood MBTA Station. The goal will be to disturb these islands as little as possible, but when the *Phragmites* and other invasive species are removed the islands will be replanted in areas of disturbance as described above for rehabilitation of areas after removal of invasive material. These islands are not accessible to the public now and will remain inaccessible thus continuing to provide safe wildlife habitat.

- Also in the Riverway, between Brookline Avenue and Netherlands Road, there is a large island with two bridges. This island has always been accessible to the public and will remain accessible. Invasive vegetation on banks and over water, such as *Phragmites* and Japanese Knotweed, will be removed and the river dredged to improve flow and flood flow. Rehabilitation of the landscape will include both plant massing and the construction of "beaches" to reflect the Primary Period of Significance. The original shoreline and grading will also be restored to the Primary Period of Significance. Planting will include wetland planting, bank planting and upland planting of both shrub and tree layers to improve wildlife habitat and to historically restore the landscape. Beaches will include a wetland edge to improve wildlife habitat and lawn on banks and upland to restore the original historic viewsheds. The Olmsted plant lists will be utilized for plant selection. The mainland bank of the island on the west will not have a wetland shelf since the area is very narrow and the bank is steep, but the island side can accommodate the wetland shelf.

- After completion of the dredging, the staging area at the Netherlands Roa be rehabilitated. At Netherlands Road existing trees to remain within or a the staging area will be protected and pruned, existing paths and sidewall rehabilitated, and existing lawn areas will be restored.

- Existing desire line paths, which have resulted in erosion of lawn areas, w regraded and constructed either as new paths or planting, will be utilized and redirect movement in an effort t to incorporate best management prac

Refer to Preliminary Plan L-24 to L-36 for proposed treatment in Riverway.

3.4.1.4 Leverett Pond

The existing site has extant historical resources with integrity from the Prima of Significance. Documentation of this area will provide the needed informa restore the shoreline after dredging and removal of invasive plant material f banks and to identify and to protect the extant features. Planting plans, grad viewshed design and plant lists are complete for the Primary Period and wil the information needed to rehabilitate the areas disturbed during this projec

Treatment at Leverett Pond, as well as the restoration of the Babbling Brook Willow Pond Road to Leverett Pond will include:

- After dredging is complete, the original shoreline and grading will be rest the Primary Period of Significance. Stabilization of banks after dredging v include plant massing and the construction of "beaches" to reflect the Pri Period of Significance. Planting will include wetland planting, bank plant upland planting of both shrub and tree layers to improve wildlife habitat historically restore the landscape. Beaches will include a wetland edge to wildlife habitat and lawn on banks and upland to restore the original hist viewsheds. At Leverett Pond the restoration of the historic beach on the n side of the Pond will require restoration of an historic path to re-establish pedestrian access to the beach in keeping with the Primary Period. The Ol plant lists will be utilized for plant selection.

- Rehabilitation of the landscape, after removal and dredging of invasive m such as Purple Loosestrife at the Pond and Japanese Knotweed at the Bro include both plant massing and the construction of "beaches" to reflect th Period of Significance. The Brookline shoreline had gabions installed into shoreline in the 1880's. Invasive plant material has taken hold in gabions have become silted. These invasive species will be removed, the gabions v protected, and wetland plants will be planted into the gabions. Planting w include wetland planting, bank planting and upland planting of both shr tree layers to improve wildlife habitat and to historically restore the lands Beaches at the Pond will include a wetland edge to improve wildlife habi lawn on banks and upland to restore the original historic viewsheds. Plan

Brook will include bank planting and upland planting of both shrub and tree layers to improve wildlife habitat and to historically restore the landscape. The Olmsted plant lists will be utilized for plant selection.

- In Olmsted Park there are three islands. The two larger islands are the original historic islands and currently provide safe wildlife habitat. They are not accessible to the public and will remain inaccessible. The third or center island was reconstructed in the 1980s. Plantings and the shape of the island were not successful and the island has minimal vegetative cover today. The goal will be to disturb the two larger islands as little as possible, but when invasive species are removed the islands will be replanted in areas of disturbance as described above for rehabilitation of areas after removal of invasive material. The third island will be reshaped and planted to reflect the Primary Period of Significance. Planting will include wetland planting, bank planting and upland planting of both shrub and tree layers to create wildlife habitat and to historically restore the landscape. The goal for this third island will be to replicate the other two islands and to also not be accessible to the public thus providing safe wildlife habitat. The Olmsted plant lists will be utilized for plant selection.

- After completion of the dredging, the staging area at the Daisy Field area will be rehabilitated. At Daisy Field existing trees to remain adjacent or within the staging area will be protected and pruned, existing paths will be rehabilitated, existing lawn areas will be restored and the existing ballfield complete with lighting, backstop, seating and fencing will be rehabilitated. The area will not be restored to the Primary Period when it was an open meadow. The continuum will be respected and the field will be reoriented and the infield will be a combination of grass and infield mix in conformance with the 1990 Emerald Necklace Master Plan.

- Restoration of the Babbling Brook to restore flow through the open channel.

Refer to Preliminary Design Plans L-37 to L-43 for proposed treatment in the Leverett Pond area.

3.4.1.5 Willow Pond

The existing site has extant historical resources with integrity from the Primary Period of Significance. Documentation of this area will provide the needed information to restore the shoreline after dredging and removal of invasive plant material from the banks and to identify and to protect the extant features. Planting plans, grading plans, viewshed design and plant lists are complete for the Primary Period and will provide the information needed to rehabilitate the areas disturbed during this project.

Treatment for Willow Pond, as well as, the restoration of the Babbling Brook from Wards Pond to Willow Pond will include:

- After dredging is complete, the original shoreline and grading will be rest
  the Primary Period of Significance. Stabilization of banks after dredging w
  include plant massing and the construction of "beaches" to reflect the Prin
  Period of Significance. Planting will include wetland planting, bank planti
  upland planting of both shrub and tree layers to improve wildlife habitat a
  historically restore the landscape. Beaches will include a wetland edge to i
  wildlife habitat and lawn on banks and upland to restore the original histo
  viewsheds. At Willow Pond the restoration of the historic beach on the nor
  side of the Pond will require restoration of an historic path connecting Wil
  Pond to Willow Pond Road. The Olmsted plant lists will be utilized for pla
  selection.

- Rehabilitation of the landscape, after removal and dredging of invasive ma
  such as Japanese Knotweed will occur at both the Pond banks and on the b
  the Babbling Brook. Restoration will include both plant massing at the Por
  Brook and the construction of "beaches" at the Pond both to reflect the Pri
  Period of Significance. Planting at the Pond will include wetland planting,
  planting and upland planting of both shrub and tree layers to improve wi
  habitat and to historically restore the landscape. Beaches at the Pond will i
  wetland edge to improve wildlife habitat and lawn on banks and upland t
  the original historic viewsheds. Planting at the Brook will include bank pla
  and upland planting of both shrub and tree layers to improve wildlife hab
  to historically restore the landscape to the Primary Period of Significance.
  Olmsted plant lists will be utilized for plant selection for both the Pond an

- Rehabilitation of the shoreline will also include restoration of the culvert b
  with pudding stone "teeth" and rock bank (waterfall) from Spring Pond in
  Willow Pond, as well as the resetting of stones in the Babbling Brook from
  Pond to Willow Pond and the small waterfall under the pedestrian bridge
  upstream side of the Pond. Restoration of these features will reflect the Pri
  Period of Significance.

- Dredging of Wards Pond will require piping to be laid on the path above t
  between Wards and Willow. Any disturbance of paths or landscape in this
  be replaced in kind. The path is currently a stonedust path and vegetation
  herbaceous and shrub layer under woodland trees. The dredging of Willo
  will require piping across Willow Pond Road to the Daisy Field area. Path
  and planting will be replaced in kind.

Refer to Preliminary Design Plans L-43 to L-45 for proposed treatment in the
Pond area.

3.4.1.6 Wards Pond

The existing site has extant historical resources with integrity from the Primary Period of Significance. Documentation of this area will provide the needed information to restore the shoreline after dredging and removal of invasive plant material from the banks and to identify and to protect the extant features. Planting plans, grading plans, viewshed design and plant lists are complete for the Primary Period and will provide the information needed to rehabilitate the areas disturbed during this project.

Treatment at Ward's Pond will include:

- After dredging is complete, the original shoreline and grading will be restored in areas disturbed during construction to the Primary Period of Significance. Stabilization of banks after dredging will include plant massing and the construction of "beaches" to reflect the Primary Period of Significance. Planting will include wetland planting, bank planting and upland planting of both shrub and tree layers to improve wildlife habitat and to historically restore the landscape. Beaches will include a wetland edge to improve wildlife habitat and lawn on banks and upland to restore the original historic viewsheds. The Olmsted plant lists will be utilized for plant selection.

- Rehabilitation of the landscape, after removal and dredging of invasive materials on banks and over water such as Japanese Knotweed and Water Willow will include both plant massing and the construction of "beaches" to reflect the Primary Period of Significance. Three "beaches" were designed by Olmsted to provide important viewsheds of and within the Pond. Planting of these "beaches" will include a wetland edge to improve wildlife habitat and lawn on banks and upland to restore the original historic viewsheds.. The Olmsted plant lists will be utilized for plant selection. It should be noted that a large percentage of the banks and shoreline will not be disturbed during construction operation, so these areas will be left as they currently exist.

East side of Ward's Pond looking South, c. 1900, BPL Print Room. Documents beach and planting form Primary Period of Significance.

- Rehabilitation of the shoreline will also include restoration of the culvert bridge with pudding stone "teeth" at the outlet to the Babbling Brook in accordance with the Olmsted Primary Period of Significance. This bridge collapsed and currently stepping stones in the water provide the means of crossing. An existing culvert bridge at the southwest corner of the boardwalk is still functioning and is a duplicate of the missing crossing. The banks and paths on either side of the collapsed culvert crossing are silting into the water so reconstruction of the crossing will mitigate this BMP issue.

- Access into Wards Pond will impact an existing historic bridge and the p banks of the Pond. The bridge will be protected as will existing heritage t woodland plantings. Access to the site will utilize the entry drive into an parking lot off Pond Avenue. Any damage to existing features will be rep kind. The path is currently a stonedust path and vegetation is an herbace shrub layer under woodland trees.

Refer to Preliminary Design Plans L-47 to L-50 for proposed treatment in th Pond area.

3.4.2 Headwall Treatment

For the new Riverway and Brookline Avenue culverts, headwalls will be co of cast-in-place concrete on concrete foundations. In areas where the are mu culvert inlets and outlets (i.e., upstream and downstream ends of Riverway downstream end of Brookline Avenue if the existing 7'x9' culvert is retained headwalls will be constructed to integrate all of the openings into one singu headwall. The headwalls will be faced with asher stone at a slight slant to m match up with other culverts headwall exterior facings along the River.

For the culvert at Avenue Louis Pasteur, the downstream headwall will be r using the existing pudding stone as the facing for the headwall. A new conc headwall will be constructed of cast-in-place concrete on a concrete footing existing pudding stone will be reused as the facing material. Prior to restora existing pudding stone will be removed by hand along with all of the existi vegetation that has grown through the stones. The upstream headwall will reconstructed using the pudding stone that currently serves as a decorative upstream of the culvert. In addition, it is believed that additional pudding s buried on the upstream side of the culvert. The upstream side will therefore excavated in a manner to save and reuse any additional pudding stone that The upstream site will be constructed in the same manner as the downstrea

3.5 Habitat Impacts

The proposed construction and re-vegetation work will improve the habita around the Muddy River. The plantings are designed to re-create, to the ext historical habitat. **Table 3-3** is a list of proposed plantings which were taker historical records. A complete list of the Emerald Necklace Plants is in App

3.6 Traffic

The following traffic-related mitigation is proposed:

- Equipment mobilization to/ from the staging areas and the areas of culv construction will require police supervision as a safety precaution. For tr entering and exiting the staging area where a sidewalk crossing occurs, t contractor will be required to provide a ground guide.

TABLE 3-3

OPOSED WETLAND, SHRUB AND CANOPY PLANTINGS FOR HABITAT AND HISTORIC VALUE

ecies	Indicator Status,Landscape Position
nsted Shrubs and Trees	
Red maple *(Acer rubrum)*	FAC, Canopy
Speckled alder *(Alnus rugosa)*	FACW+,Shrub
Smooth alder *(Alnus serulata)*	OBL, Shrub
Red chokeberry *(Aronia arbutafolia)*	FACW, Shrub
Lady Fern *(Athyrium felix-fermia)*	FAC, Groundcover
Gray birch *(Betula populifolia)*	FAC, Canopy
Buttonbush *(Cephalanthus occidentalis)*	OBL, Shrub
Sweet pepperbush *(Clethra alnifolia)*	FAC+, Shrub
Silky dogwood *(Cornus amomum)*	FACW, Shrub
Red-osier dogwood *(Cornus stolonifera)*	FACW+
Witch-hazel *(Hamamelis virginiana)*	FAC-
Winterberry *(Ilex verticillata)*	FACW+, Shrub
Spicebush *(Lindera benzoin)*	FACW-, Shrub
Cinnamon fern *(Osmunda cinnamomea)*	FACW, Groundcover
Swamp azalea *(Rhododendron viscosum)*	OBL, Shrub
Common elderberry *(Sambucus canadensis)*	FACW-, Shrub
Withe-rod *(Viburnum cassinoides)*	FACW, Shrub
Arrowwood *(Viburnum dentatum)*	FAC, Shrub
Nannyberry *(Viburnum lentago)*	FAC, Shrub
upelo *(Nyssa sylvatica)*	FACW+, Canopy
reline Plants	
Blue Joint Grass *(Calamagrostis canadensis)*	FACW,
ack-in-the-pulpit *(Arisaema triphyllum)*	FACW,
urk's Cap Lily *(Lilium superbun)*	FACW,
t John's Wort *(Hypericum virginicum) (Hypericum canadense)*	FACW,
orget-me -nots *(Myosotis scorpioides)*	FACW,
ardinal flower *(Lobelia cardinalis)*	FACW,

TABLE 3-3 (cont.)

PROPOSED WETLAND, SHRUB AND CANOPY PLANTINGS FOR HABIT
HISTORIC VALUE

Emergent Wetland Plants

Broadleaf arrowhead *(Sagittaria latifolia)*	OBL,
Pickerelweed *(Pontederia cordata)*	OBL,
Blue flag *(Iris versicolor)*	OBL,
American burreed *(Sparganium americanum)*	OBL,
Soft-stemmed bulrush *(Scirpus validus)*	OBL,
Three Square bullrush *(Scirpus pungens)*	OBL,
Sweet flag *(Acornus calamus)*	OBL,
Water smartweed *(Polygonum amphibium)*	OBL,
Arrow arum *(Peltandra virginica)*	OBL,
Water plantain *(Alisma plantago-aquatica)*	OBL,
Marsh-mallow *(Hibiscus moscheutos formerly Hibiscus palustris)*	OBL,

KEY

Habitat Conditions:

FACW	Facultative Wetland - plants that occur in wetlands (67-99%) of the ti are occasionally found in upland areas.
FAC	Facultative - plants that occur in wetlands (34-66%) of the time, altho are equally likely to occur in upland areas.
FACU	Plants that usually occur in uplands and are seldom found in wetlan
OBL	Obligate - plants that grow in saturated or inundated conditions (>99 the time during the growing season.
NI	Not indicated.

+ or – categories: '+ ' indicates a frequency to grow in wetter conditions, and '-' i a frequency to grow in dryer conditions.

Landscape Position:

Groundcover: not to exceed 3-feet in height.
Shrub: 3-20 feet in height.
Canopy: Greater than 15-feet in height.

- Staging area construction activity will be restricted to off-peak traffic demand periods. No traffic generating activities will be allowed during the morning or evening peak traffic demand periods (7:00 to 9:00 AM or 4:00 to 6:00 PM).

- Culvert construction across Brookline Avenue will be restricted to nighttime periods. Culvert construction across the Riverway/the Fenway will be restricted to no more than one-lane closures. Signal timing adjustments will be needed at several intersections through the Sears Rotary as a result of these lane closures.

- Contractors must be required to follow the truck haul routes designated on Figure A-1 in the Appendix. This will help minimize truck traffic on residential roadways not appropriate for truck traffic.

- All sidewalks and paths will be fully restored once construction activity has ended.

- Contractor parking will be provided either within the bounds of an active staging area or off-site (at a location to be determined). At no time will contractors be allowed to block a travel lane for parking. A carpooling plan is strongly encouraged, whereby oi1ly one or two contractor vehicles are parked within the staging area and other vehicles are off-site.

- Pedestrian access on Netherlands Road and Agassiz Road will be maintained while these roads are temporarily closed and used as staging areas for construction equipment.

- At the intersection of the Riverway at Brookline Avenue, there are existing capacity deficiencies that are expected to be exacerbated while Netherlands Road is closed and used as a staging area. The predominant level-of-service and delay degradation is expected to occur to the left-turning movements from Brookline Avenue onto the Riverway. The following mitigation should be considered to alleviate these impacts:

- Redesignate the Riverway northbound approach right-turn only lane as a shared through/ right- turn lane. This will require modification to the signal phasing.

- Consider upgrading the traffic signal equipment and providing an exclusive lectern. phase for both eastbound and westbound traffic on Brookline Avenue (currently, the westbound approach has a short lead phase).

- Through the Charlesgate area, adjust signal timing to allow a longer "all-red" clearance interval during the day to allow trucks more time to safely maneuver from the travelway onto the curb.

Section 4
Charlesgate 35 Percent Design

The following specification sections have been prepared:

01010	Summary of Work
01025	Measurement and Payment
01036	Special Project Procedures
01046	Control of Work
01110	Environmental Protection Procedures
01300	Submittals
01500	Temporary Facilities
01562	Dust Control
01576	Policing
01580	Project Identification and Signs
02050	Demolition
02100	Site Preparation
02120	Transportation and Disposal of Contaminated Material
02270	Erosion and Sedimentation Control
02482	Dredging and Dewatering/Drying of Dredged Material
02900	Landscaping
02901	Miscellaneous Work and Cleanup

SECTION 01010

SUMMARY OF WORK

GENERAL

LOCATION OF WORK

All of the work of this Contract is located on land owned by the City of Boston, Massachusetts and the Metropolitan District Commission, as shown on the Drawings.

WORK TO BE DONE

Furnish all labor, materials, equipment, tools, services and incidentals and complete all work required by these Specifications and as shown on the Drawings to dredge deposited sediments from the Charlesgate section of the Muddy River including removing deposited sediments from culverts and removing stop log structure.

Perform the Work complete, and shall include repairs, replacements and restoration required as a result of damages caused during this construction.

Furnish and install all materials, equipment and labor which is reasonably and properly inferable and necessary for the proper completion of the Work, whether specifically indicated in the Contract Documents or not.

GENERAL DESCRIPTION OF CONTRACT

The Charlesgate section of the Muddy River is approximately 1,300 feet in length and the average width is approximately 45 feet.

It is estimated that approximately 3,300 cubic yards of deposited sediment is to be removed under this Contract.

DRAWINGS AND SPECIFICATIONS FURNISHED THE CONTRACTOR FOR CONSTRUCTION

Three sets of Drawings and Specifications shall be furnished to the Contractor for construction at no charge. Additional sets may be purchased at the deposit amount contained in the Notice for Bids.

ABBREVIATIONS AND REFERENCES

Whenever reference is made to the furnishing of materials or testing thereof to conform to the standards of any technical society, organization or body, it shall be construed to mean the latest standard, code, specification or tentative specification adopted and published at the date of advertisement for bids, even though reference has been made to an earlier standard. The following list of specifications is hereby made a part of the Contract the same as if herein repeated in full. In the event of any conflict between any of these specifications, standards, codes or tentative specifications, and the Specifications, the latter shall govern. In the event that one of the following conflict with another, the decision as to which shall govern decided by the Engineer, whose judgment will be final.

B. Reference to a technical society, organization, or body may be made in the Specifica abbreviations, in accordance with the following list:

1. The American Association of State Highway and Transportation Officials (AAS
2. American Concrete Institute (ACI)
3. American Gas Association (AGA)
4. American Gear Manufacturers Association (AGMA)
5. Institute of Electrical and Electronic Engineers (IEEE)
6. American Institute of Steel Construction (AISC)
7. American Iron and Steel Institute (AISI)
8. American National Standards Institute (ANSI)
9. American Petroleum Institute (API)
10. American Society of Civil Engineers (ASCE)
11. American Society of Mechanical Engineers (ASME)
12. American Society of Testing Materials (ASTM)
13. American Wood Preservers Association (AWPA)
14. American Welding Society (AWS)
15. American Water Works Association (AWWA)
16. Federal Specifications (Fed. Spec.)
17. Cast Iron Pipe Research Association (CIPRA)
18. Ductile Iron Pipe Research Association (DIPRA)
19. National Clay Pipe Institute (NCPI)
20. National Electrical Manufacturers Association (NEMA)
21. National Fire Protection Association (NFPA)
22. New England Water Works Association (NEWWA)

23. Tile Council of America Inc. (TCA)

24. American Wood Preservation Association (AWPA)

25. Navy Department Specification

26. National Electric Code (NEC)

27. National Lumber Manufacturers Association (NLMA)

28. Society of Automotive Engineers Standards (SAE)

29. Steel Heating Boiler Institute (SHBI)

30. Standard Building Code Congress International, Inc. (SBCC)

31. Florida Department of Transportation (DOT)

32. Underwriter's Laboratories, Inc. (UL)

33. Occupation Health and Safety Act (OSHA)

34. Steel Structures Painting Council (SSPC)

35. Instrument Society of America (ISA)

36. Environmental Protection Agency (EPA)

When no reference is made to a code, standard, or specification, the standard specifications of the ASTM, the ANSI, the ASME, the IEEE, or the NEMA shall govern.

PRODUCTS (NOT USED)

EXECUTION (NOT USED)

END OF SECTION

SECTION 01025

MEASUREMENT AND PAYMENT

GENERAL

REMOVAL OF STOP LOG STRUCTURE (Item 1)

Measurement

1. Measurement of the removal of stop log structure will be on a lump sum basis for all work defined in the Specifications and on the Drawings.

Payment

1. Payment for the removal of stop log structure will be made at the lump sum price bid for Item 1 of the Bid Form. Price and payment shall be full compensation for removal and disposal of stop logs and all else incidental thereto for which separate payment is not provided under other items.

RIVER CHANNEL DREDGING (Item 2)

Measurement

1. Measurement of river channel dredging will be on a volume basis for all work defined in the Specifications and on the Drawings. The volume will be computed based on the elevation difference between the pre- and post-dredging bathymetry survey.

Payment

1. Payment of river channel dredging will be made at the unit price per cubic yard bid for Item 2 of the Bid Form. Price and payment shall be full compensation for dredging and dewatering river channel sediments and all else incidental thereto for which separate payment is not provided under other items.

REMOVAL OF DEPOSITED SEDIMENTS FROM CULVERTS (Item 3)

Measurement

1. Measurement for removal of deposited sediment from culverts will be on a volume basis for all work defined in the Specifications and on the Drawings. The volume will be computed based on the elevation difference between the pre- and post-bathymetry survey.

Payment

1. Payment for removal of deposited sediment from culverts will be made at the unit price per cubic yard bid for Item 3 of the Bid Form. Price and payment shall be full compensation for removal and dewatering of deposited sediment and all else incidental thereto for which separate payment is not provided under other items.

1.04 OFF-SITE DISPOSAL OF DEPOSITED SEDIMENT (Item 4)

A. Measurement

1. Measurement of off-site disposal of deposited sediment shall be the weight dispo off-site, as required, in tons, as determined by certified scale measurement.

B. Payment

1. Payment for the removal and disposal of the contaminated soil will be made at th price per ton bid for Item 4 of the Bid Form, which price and payment shall be fu compensation for transportation and disposal, facility required testing and all els incidental thereto for which separate payment is not provided under other items.

END OF SECTION

SECTION 01036

SPECIAL PROJECT PROCEDURES

GENERAL

REQUIREMENTS

The following special procedures are required for work under this Section.

SAFETY AND HEALTH PLAN

The Contractor shall be responsible for the development, implementation and monitoring of a Safety and Health plan necessary to ensure safe operations for all aspects of work covered by this Contract. The plan shall be based on all applicable Occupational Safety and Health Administration (OSHA) standards and regulations. The Contractor's Safety and Health Plan shall provide for a safety and health officer and shall address the following items:

1. Identification of contaminated and uncontaminated work areas.
2. Training of Contractor personnel.
3. Medical surveillance.
4. Communications.
5. Emergency and first aid requirements.
6. Personal safety clothing and equipment.
7. Personal hygiene.
8. Air monitoring (not required with appropriate engineering).
9. Contaminant control.
10. Dust control.
11. Sampling procedures for tank liquids and residues, soil and groundwater.
12. Procedure for the safe removal of liquids and gases from within the tanks and piping.
13. Procedure for thermal cutting of tank.
14. Personnel decontamination.
15. Handling and transportation of materials.
16. Contingency plans for adjustment of work procedures for protection of Owner's personnel, workers and transients.

B. The Contractor's Safety and Health Plan shall be submitted to the Owner within 5 day following award of Contract.

C. Contractor's Safety and Health Plan shall include contingency plans for protecting all including those outside of the work area from exposure to airborne contamination.

D. Appoint a Site Safety Officer who shall monitor conformance with the Health and Saf

1.03 DISPOSAL OF WASTES

A. Comply with all applicable regulatory requirements and other Federal, State or local l and ordinances which govern or regulate the handling, transportation and disposal of wastes.

B. Obtain all the necessary permits and licenses associated with compliance with Hazard Manifest System.

C. Mark, label, placard, package and manifest wastes in accordance with all applicable F State and local regulations which govern the handling of hazardous wastes.

D. Ensure protection against spillage of waste and shall act in accordance with all applic Federal, State and local laws, regulations and ordinances which govern the handling o hazardous wastes.

E. Submit with the Quotation a detailed program proposed to follow in the disposing of sludges and residues and other materials identified in this Section. The program shall as a minimum, the following:

   1. The details for the on-site storage of liquids, residues and other materials.

   2. Methods of transportation and the name of the company transporting the above.

   3. Location, capacity and name of firm(s) performing ultimate disposal of the liqui residues, sludges and other materials.

   4. Cleaning and/or treatment procedures for any contaminated material the Contrac proposes to dispose of by alternate methods.

1.04 PROTECTION OF ABUTTORS

A. During the course of the work, including shutdown periods, the Contractor shall be re for protecting Owner personnel and unauthorized personnel from contact with contam materials. Erect fencing or other suitable barriers as necessary to protect work areas stockpiles from intruders, both accidental and deliberate.

END OF SECTION

SECTION 01046

CONTROL OF WORK

GENERAL

PLANT

Furnish plant and equipment which will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress which will ensure the completion of the work within the Contract Time. If at any time such plant appears to be inefficient, inappropriate or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, Engineer may order the Contractor to increase the efficiency, change the character or increase the plant equipment and the Contractor shall conform to such order. Failure of the Engineer to give such order shall in no way relieve the Contractor of his obligations to secure the quality of the work and rate of progress required.

PRIVATE LAND

Do not enter or occupy private land outside of easements, except by permission of the land owner.

PIPE LOCATIONS

Locate pipelines substantially as indicated on the Drawings. The Engineer reserves the right to make such modifications in locations as may be found desirable to avoid interference with existing structures or for other reasons. Where fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve him from laying and jointing different or additional items where required.

OPEN EXCAVATIONS

Adequately safeguard all open excavations by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons and damage to property. Provide suitable and safe bridges and other crossings for accommodating travel by pedestrians and workmen. Remove bridges provided for access during construction when no longer required. The length or size of excavation will be controlled by the particular surrounding conditions, but shall always be confined to the limits prescribed by the Engineer. If the excavation becomes a hazard, or if it excessively restricts traffic at any point, the Engineer may require special construction procedures such as limiting the length of the open trench, prohibiting stacking excavated material in the street and requiring that the trench shall not remain open overnight.

Take precautions to prevent injury to the public due to open trenches. Provide adequate light at all trenches, excavated material, equipment, or other obstacles which could be dangerous to the public at night.

1.05 TEST PITS

A. Excavate test pits, at the direction of the Engineer, to locate underground pipelines or
in advance of the construction. Backfill test pits immediately after their purpose has b
satisfied and restore and maintain the surface in a manner satisfactory to the Engineer.

1.06 MAINTENANCE OF TRAFFIC

A. Unless permission to close a street is received in writing from the proper authority, pla
excavated material so that vehicular and pedestrian traffic may be maintained at all tin
the construction operations cause traffic hazards, repair the road surface, provide temp
ways, erect wheel guards or fences, or take other measures for safety satisfactory to th
Engineer.

B. Detours around construction will be subject to the approval of the Owner and the Engi
Where detours are permitted, provide all necessary barricades and signs as required to
the flow of traffic. Expedite construction operations while traffic is detoured. Periods
traffic is being detoured will be strictly controlled by the Owner.

C. Take precautions to prevent injury to the public due to open trenches. Night watchme
required where special hazards exist, or police protection provided for traffic while w
progress. Be fully responsible for damage or injuries whether or not police protection
provided.

1.07 CARE AND PROTECTION OF PROPERTY

A. Be responsible for the preservation of all public and private property and use every pr
necessary to prevent damage thereto. If any direct or indirect damage is done to publi
private property by or on account of any act, omission, neglect, or misconduct in the e
of the work on the part of the Contractor, restore such property to a condition similar
to that existing before the damage was done, or make good the damage in other mann
acceptable to the Engineer.

1.08 PROTECTION AND RELOCATION OF EXISTING STRUCTURES AND UTILITI

A. Assume full responsibility for the protection of all buildings, structures, and utilities,
private, including poles, signs, services to buildings, utilities in the street, gas pipes, w
pipes, hydrants, sewers, drains and electric and telephone cables, whether or not they
on the Drawings. Carefully support and protect all such structures and utilities from i
any kind. Immediately repair any damage resulting from the construction operations.

B. Assistance will be given the Contractor in determining the location of existing service
Contractor, however, shall bear full responsibility for obtaining all locations of under
structures and utilities (including existing water services, drain lines and sewers). Ma
services to buildings and pay costs or charges resulting from damage thereto.

C. Notify all utility companies in writing at least 72 hours (excluding Saturdays, Sunday
Legal holidays) before excavating in any public way. Also notify Massachusetts Dig
telephone 1-888-344-7233 at least 72 hours prior to start of work.

Coordinate the removal and replacement of traffic loops and signals, if required for the performance of the work, at no additional cost to the Owner.

WATER FOR CONSTRUCTION PURPOSES

In locations where public water supply is available, the Contractor may be allowed to use water without charge for construction purposes.

The express approval of the Owner shall be obtained before water is used. Waste of water shall be sufficient cause for withdrawing the privilege of unrestricted use. Hydrants shall only be operated under the supervision of the Owner's personnel.

MAINTENANCE OF FLOW

Provide for the flow of sewers, drains and water courses interrupted during the progress of the work, and immediately cart away and remove all offensive matter. Discuss the entire procedure of maintaining existing flow with the Engineer well in advance of the interruption of any flow.

COOPERATION WITHIN THIS CONTRACT

All firms or persons authorized to perform any work under this Contract shall cooperate with Contractor and Subcontractors or trades and assist in incorporating the work of other trades where necessary or required.

Cutting and patching, drilling and fitting shall be carried out where required by the trade or subcontractor having jurisdiction, unless otherwise indicated herein or directed by the Engineer.

CLEANUP AND DISPOSAL OF EXCESS MATERIAL

During the course of the work, keep the site of operations as clean and neat as possible. Dispose of all residue resulting from the construction work and, at the conclusion of the work, remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures and any other refuse remaining from the construction operations and leave the entire site of the work in a neat and orderly condition.

In order to prevent environmental pollution arising from the construction activities related to the performance of this Contract, comply with all applicable Federal, State and local laws and regulations concerning waste material disposal, as well as the specific requirements stated in this Section and in other related Sections.

Disposal of excess excavated material in wetlands, stream corridors and plains is strictly prohibited even if the permission of the property owner is obtained. Any violation of this restriction by the Contractor or any person employed by him, will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken against the offending parties. The Contractor will be required to remove the fill and restore the area impacted at no increase in the Contract Price.

END OF SECTION

SECTION 01110

ENVIRONMENTAL PROTECTION PROCEDURES

GENERAL

SCOPE OF WORK

Furnish all labor, materials and equipment and perform all work required for the prevention of environmental pollution in conformance with applicable laws and regulations, during and as the result of construction operations under this Contract. For the purpose of this Section, environmental pollution is defined as the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to man; or degrade the utility of the environment for aesthetic and/or recreational purposes.

The control of environmental pollution requires consideration of air, water and land, and involves management of noise and solid waste, as well as other pollutants.

Schedule and conduct all work in a manner that will minimize the erosion of soils in the area of the work. Provide erosion control measures such as diversion channels, sedimentation or filtration systems, berms, staked hay bales, seeding, mulching or other special surface treatments as are required to prevent silting and muddying of streams, rivers, impoundments, lakes, etc. All erosion control measures shall be in place in an area prior to any construction activity in that area.

This Section is intended to ensure that construction is achieved with a minimum of disturbance to the existing ecological balance between a water resource and its surroundings. These are general guidelines. It is the Contractor's responsibility to determine the specific construction techniques to meet these guidelines.

APPLICABLE REGULATIONS

Comply with all applicable Federal, State and local laws and regulations concerning environmental pollution control and abatement.

NOTIFICATIONS

The Engineer will notify the Contractor in writing of any non-compliance with the foregoing provisions or of any environmentally objectional acts and corrective action to be taken. State or local agencies responsible for verification of certain aspects of the environmental protection requirements shall notify the Contractor in writing, through the Engineer, of any non-compliance with State or local requirements. After receipt of such notice from the Engineer or from the regulatory agency through the Engineer, immediately take corrective action. Such notice, when delivered to the Contractor or his authorized representative at the site of the work, shall be deemed sufficient for the purpose. If the Contractor fails or refuses to comply promptly, the Owner may issue an order stopping all or part of the work until satisfactory corrective action has been taken. No part of the time lost due to any such stop orders shall be made the subject of a claim for extension of time or for excess costs or by the Contractor unless it is later determined that the Contractor was in compliance.

1.04 IMPLEMENTATION

A. Prior to commencement of the work, meet with the Engineer to develop mutual under relative to compliance with these provisions and administration of the environmental control program.

B. Remove temporary environmental control features, when approved by the Engineer ar incorporate permanent control features into the project at the earliest practicable time.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EROSION CONTROL

A. Provide positive means of erosion control such as shallow ditches around construction off surface water. Erosion control measures, such as siltation basins, hay check dams, mulching, jute netting and other equivalent techniques, shall be used as appropriate. F surface water into excavated areas shall be prevented. Ditches around construction ar also be used to carry away water resulting from dewatering of excavated areas. At the completion of the work, ditches shall be backfilled and the ground surface restored to condition.

3.02 PROTECTION OF STREAMS AND SURFACE WATERS

A. Take all precautions to prevent, or reduce to a minimum, any damage to any stream o water from pollution by debris, sediment or other material, or from the manipulation equipment and/or materials in or near such streams. Water that has been used for was processing, or that contains oils or sediments that will reduce the quality of the water stream, shall not be directly returned to the stream. Divert such waters through a settl or filter before being directed into streams or surface waters.

B. Do not discharge water from dewatering operations directly into any live or intermitte channel, wetlands, surface water or any storm sewer. Water from dewatering operatio be treated by filtration, settling basins, or other approved method to reduce the amoun sediment contained in the water to allowable levels.

3.03 PROTECTION OF LAND RESOURCES

A. Restore land resources within the project boundaries and outside the limits of perman to a condition, after completion of construction, that will appear to be natural and not from the appearance of the project. Confine all construction activities to areas shown Drawings.

B. Outside of areas requiring earthwork for the construction of the new facilities, do not injure, or destroy trees or shrubs, nor remove or cut them without prior approval. No cables, or guys shall be fastened to or attached to any existing nearby trees for anchor specifically authorized by the Engineer. Where such special emergency use is permitted, first wrap the trunk with a sufficient thickness of burlap or rags over which softwood cleats shall be tied before any rope, cable, or wire is placed. The Contractor shall in any event be responsible for any damage resulting from such use.

Before beginning operations near them, protect trees that may possibly be defaced, bruised, injured, or otherwise damaged by the construction equipment, dumping or other operations, by placing boards, planks, or poles around them. Monuments and markers shall be protected similarly.

Any trees or other landscape features scarred or damaged by the Contractor's equipment or operations shall be restored as nearly as possible to their original condition. The Engineer will decide the method of restoration to be used and whether damaged trees shall be treated and healed or removed and disposed of.

1. All scars made on trees by equipment, construction operations, or by the removal of limbs larger than 1-in in diameter shall be coated as soon as possible with an approved tree wound dressing. All trimming or pruning shall be performed in an approved manner by experienced workmen with saws or pruning shears. Tree trimming with axes will not be permitted.

2. Climbing ropes shall be used where necessary for safety. Trees that are to remain, either within or outside established clearing limits, that are subsequently damaged by the Contractor and are beyond saving in the opinion of the Engineer, shall be immediately removed and replaced.

The locations of the Contractor's storage and other construction buildings, required temporarily in the performance of the work, shall be cleared portions of the job site or areas to be cleared as shown on the Drawings and approved by the Engineer and shall not be within wetlands or floodplains. The preservation of the landscape shall be an imperative consideration in the selection of all sites and in the construction of buildings. Drawings showing storage facilities shall be submitted for approval of the Engineer.

If the Contractor proposes to construct temporary roads or embankments and excavations for plant and/or work areas, he shall submit the following for approval at least ten days prior to scheduled start of such temporary work.

1. A layout of all temporary roads, excavations, embankments and drainage to be constructed within the work area.

2. Details of temporary road construction.

3. Drawings and cross sections of proposed embankments and their foundations, including a description of proposed materials.

4. A landscaping drawing showing the proposed restoration of the area. Indicate the proposed removal of any trees and shrubs outside the limits of existing clearing area. Indicate locations of guard posts or barriers required to control vehicular traffic and protect trees and shrubs to be maintained undamaged. The Drawing shall provide for the obliteration of construction scars as such and shall provide for a natural appearing final

condition of the area. Modification of the Contractor's approved drawings shall only with the written approval of the Engineer. No unauthorized road constructi excavation or embankment construction including disposal areas will be permitte

G. Remove all signs of temporary construction facilities such as haul roads, work areas, foundations of temporary structures, stockpiles of excess of waste materials, or any ot vestiges of construction as directed by the Engineer. It is anticipated that excavation, and plowing of roadways will be required to restore the area to near natural condition will permit the growth of vegetation thereon. The disturbed areas shall be prepared a as approved by the Engineer.

H. All debris and excess material will be disposed of outside wetland or floodplain areas environmentally sound manner.

3.04 PROTECTION OF AIR QUALITY

A. Burning - The use of burning at the project site for the disposal of refuse and debris w permitted.

B. Dust Control - Maintain all excavations, embankment, stockpiles, access roads, plant waste areas, borrow areas and all other work areas within or without the project boun from dust which could cause the standards for air pollution to be exceeded and which cause a hazard or nuisance to others.

C. An approved method of stabilization consisting of sprinkling or other similar methods permitted to control dust. The use of petroleum products is prohibited. The use of ch may be permitted with approval from the Engineer.

D. Sprinkling, to be approved, must be repeated at such intervals as to keep all parts of th disturbed area at least damp at all times, and the Contractor shall have sufficient com equipment on the job to accomplish this. Dust control shall be performed as the work and whenever a dust nuisance or hazard occurs, as determined by the Engineer.

3.05 NOISE CONTROL

A. Make every effort to minimize noises caused by the construction operations. Equipm be equipped with silencers or mufflers designed to operate with the least possible nois compliance with Federal and State regulations.

3.06 MAINTENANCE OF POLLUTION CONTROL FACILITIES DURING CONSTRU

A. Maintain all facilities constructed for pollution control as long as the operations creati particular pollutant are being carried out or until the material concerned has become s to the extent that pollution is no longer being created.

END OF SECTION

SECTION 01300

SUBMITTALS

GENERAL

DESCRIPTION OF REQUIREMENTS

This Section specifies the general methods and requirements of submissions applicable to work plans. Additional general submission requirements are contained in Article 6.17 of the General Conditions. Detailed submittal requirements are specified in the technical Sections.

All submittals shall be clearly identified by reference to Section Number, Paragraph, Drawing Number or Detail as applicable. Submittals shall be clear and legible and of sufficient size for presentation of data.

CONTRACTOR'S RESPONSIBILITIES

Review shop drawings, product data and samples, including those by subcontractors, prior to submission to determine and verify the following:

1. Field measurements

2. Field construction criteria

3. Catalog numbers and similar data

4. Conformance with related Sections

Each shop drawing, sample and product data submitted by the Contractor shall have affixed to t the following Certification Statement including the Contractor's Company name and signed by the Contractor: "Certification Statement: by this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers and similar data and I have checked and coordinated each item with other applicable approved shop drawings and all Contract requirements." Shop drawings and product data sheets 11-in x 17-in and smaller shall be bound together in an orderly fashion and bear the above Certification Statement on the cover sheet. The cover sheet shall fully describe the packaged data and include a listing of all items within the package. Provide to the Resident Project Representative a copy of each transmittal sheet for shop drawings, product data and samples at the time of submittal to the Engineer.

The Contractor shall utilize a 10-character submittal identification numbering system in the following manner:

The first character shall be a D, S, P, M, or R, which represents Shop/Working Drawing and other Product Data (D), Sample (S), Preliminary Submittal (P), Operating/ Maintenance Manual (M), or Request for Information (R).

The next five digits shall be the applicable Section Number.

3. The next three digits shall be the numbers 001 to 999 to sequentially number eac separate item or drawing submitted under each specific Section Number.

4. The last character shall be a letter, A to Z, indicating the submission, or resubmis the same Drawing, i.e., "A=1st submission, B=2nd submission, C=3d submission typical submittal number would be as follows:

D-03300-008-B

D = Shop Drawing
03300 = Section for Concrete
008 = The eighth initial submittal under this section
B = The second submission (first resubmission) of that particular shop dr

D. Notify the Engineer in writing, at the time of submittal, of any deviations in the submi the requirements of the Contract Documents.

E. The review and approval of shop drawings, samples or product data by the Engineer s relieve the Contractor from the responsibility for the fulfillment of the terms of the Co All risks of error and omission are assumed by the Contractor and the Engineer will ha responsibility therefor.

F. No portion of the work requiring a shop drawing, sample, or product data shall be star shall any materials be fabricated or installed prior to the approval or qualified approva item. Fabrication performed, materials purchased or on-site construction accomplishe does not conform to approved shop drawings and data shall be at the Contractor's risk. Owner will not be liable for any expense or delay due to corrections or remedies requi accomplish conformity.

G. Project work, materials, fabrication, and installation shall conform with approved sho drawings, applicable samples, and product data.

1.03 SUBMISSION REQUIREMENTS

A. Make submittals promptly in accordance with approved schedule and in such sequenc cause no delay in the Work or in the work of any other contractor.

B. Each submittal, appropriately coded, will be returned within [30] working days follo receipt of submittal by the Engineer.

C. Number of submittals required:

1. Work Plans: Six copies.

D. Submittals shall contain:

1. The date of submission and the dates of any previous submissions.

2. The Project title and number.

3. Contractor identification.

4. The names of:

    a. Contractor

    b. Supplier

    c. Manufacturer

5. Identification of the product, with the section number, page and paragraph(s).

6. Field dimensions, clearly identified as such.

7. Relation to adjacent or critical features of the work or materials.

8. Applicable standards, such as ASTM or Federal Standards numbers.

9. Identification of deviations from Contract Documents.

10. Identification of revisions on resubmittals.

11. A blank space suitably sized for Contractor and Engineer stamps.

12. Where calculations are required to be submitted by the Contractor, the calculations shall have been checked by a qualified individual other than the preparer. The submitted calculations shall clearly show the names of the preparer and of the checker.

REVIEW OF SHOP DRAWINGS, PRODUCT DATA, WORKING DRAWINGS AND SAMPLES

The review of shop drawings, data and samples will be for general conformance with the design concept and Contract Documents. They shall not be construed:

1. as permitting any departure from the Contract requirements;

2. as relieving the Contractor of responsibility for any errors, including details, dimensions, and materials;

3. as approving departures from details furnished by the Engineer, except as otherwise provided herein.

The Contractor remains responsible for details and accuracy, for coordinating the work with all other associated work and trades, for selecting fabrication processes, for techniques of assembly, and for performing work in a safe manner.

f the shop drawings, data or samples as submitted describe variations and show a departure from the Contract requirements which Engineer finds to be in the interest of the Owner and to be so minor as not to involve a change in Contract Price or Contract Time, the Engineer may return the reviewed drawings without noting an exception.

D. Submittals will be returned to the Contractor under one of the following codes.

Code 1 - "APPROVED" is assigned when there are no notations or comments on the s When returned under this code the Contractor may release the equipment material for manufacture.

Code 2 - "APPROVED AS NOTED". This code is assigned when a confirmation of t notations and comments IS NOT required by the Contractor. The Contrac release the equipment or material for manufacture; however, all notations comments must be incorporated into the final product.

Code 3 - "APPROVED AS NOTED/CONFIRM". This combination of codes is assig a confirmation of the notations and comments IS required by the Contract Contractor may, at his own risk, release the equipment or material for ma however, all notations and comments must be incorporated into the final p This confirmation shall specifically address each omission and nonconfor that was noted. Confirmation is to be received by the Engineer within 15 days of the date of the Engineer's transmittal requiring the confirmation.

Code 4 - "APPROVED AS NOTED/RESUBMIT". This combination of codes is assi notations and comments are extensive enough to require a resubmittal of t package. This resubmittal is to address all comments, omissions and non-conforming items that were noted. Resubmittal is to be received by t Engineer within 15 calendar days of the date of the Engineer's transmittal the resubmittal.

Code 5 - "NOT APPROVED" is assigned when the submittal does not meet the intent Contract Documents. The Contractor must resubmit the entire package re bring the submittal into conformance. It may be necessary to resubmit us different manufacturer/vendor to meet the Contract Documents.

Code 6 - "COMMENTS ATTACHED" is assigned where there are comments attache returned submittal which provide additional data to aid the Contractor.

Codes 1 through 5 designate the status of the reviewed submittal with Code 6 showin been an attachment of additional data.

E. Resubmittals will be handled in the same manner as first submittals. On resubmittals Contractor shall identify all revisions made to the submittals, either in writing on the transmittal or on the shop drawings by use of revision triangles or other similar meth resubmittial shall clearly respond to each comment made by the Engineer on the prev submission. Additionally, the Contractor shall direct specific attention to any revisio other than the corrections requested by the Engineer on previous submissions.

F. Partial submittals may not be reviewed. The Engineer will be the only judge as to th completeness of a submittal. Submittals not complete will be returned to the Contrac will be considered "Not Approved" until resubmitted. The Engineer may at his optio a list or mark the submittal directing the Contractor to the areas that are incomplete.

Repetitive Review

1. Shop drawings and other submittals will be reviewed no more than twice at the Owner's expense. All subsequent reviews will be performed at times convenient to the Engineer and at the Contractor's expense, based on the Engineer's then prevailing rates. The Contractor shall reimburse the Owner for all such fees invoiced to the Owner by the Engineer. Submittals are required until approved.

2. Any need for more than one resubmission, or any other delay in obtaining Engineer's review of submittals, will not entitle Contractor to extension of the Contract Time.

If the Contractor considers any correction indicated on the shop drawings to constitute a change to the Contract Documents, the Contractor shall give written notice thereof to the Engineer at least 7 working days prior to release for manufacture.

When the shop drawings have been completed to the satisfaction of the Engineer, the Contractor shall carry out the construction in accordance therewith and shall make no further changes therein except upon written instructions from the Engineer.

DISTRIBUTION

Distribute reproductions of approved shop drawings and copies of approved product data and samples, where required, to the job site file and elsewhere as directed by the Engineer. Number of copies shall be as directed by the Engineer but shall not exceed six.

CONSTRUCTION PHOTOGRAPHS

Provide an average of 10 color photographs per month made of the work during its progress and 20 color photographs of the completed facilities. The photographs shall be of such views and taken at such times as the Engineer directs.

All photographic work shall be done by a qualified, established commercial photographer acceptable to the Engineer. Three prints of each photograph shall be furnished promptly to the Engineer, and each print shall have a glossy finish and be mounted in plastic sleeving on a substantial backing. The overall dimensions of each mounted print shall be 8-in by 10-in with 1-1/4-in flexible binding margin on the long top side to permit storage in standard 3-ring binders.

The film negatives shall be retained in the files of the photographer until the completion of the project and shall then be turned over to the Engineer.

Each photograph shall have attached to the backing a paper label, approximately 2-1/4-in wide by 1-3/4-in high containing thereon in neat lettering:

1. Contractor's name

2. Short Description of View

3. Photo Number and Date Taken

4. Photographer's Firm Name

1.07 SCHEDULES

A. Provide all schedules required by Articles 2.05B, 2.07, 14.01, and elsewhere in the Ge Conditions.

1.08 PROFESSIONAL ENGINEER (P.E.) CERTIFICATION FORM

A. If specifically required in other related Sections, submit a P.E. Certification for each it required, in the form attached to this Section, completely filled in and stamped.

1.09 GENERAL PROCEDURES FOR SUBMITTALS

A. Coordination of Submittal Times: Prepare and transmit each submittal sufficiently in a of performing the related work or other applicable activities, or within the time specifi individual work of other related Sections, so that the installation will not be delayed by processing times including disapproval and resubmittal (if required), coordination with submittals, testing, purchasing, fabrication, delivery and similar sequenced activities. extension of time will be authorized because of the Contractor's failure to transmit sub sufficiently in advance of the Work.

END OF SECTION

P.E. CERTIFICATION FORM

signed hereby certifies that he/she is a professional engineer registered in the [State]
wealth] of ______________________________ and that he/she has been employed by

____ to design
(Name of Contractor)

____
(Insert P.E. Responsibilities)

nce with Section ____ for the

____.
(Name of Project)

signed further certifies that he/she has performed the design of the ____________________

____, that said design is in conformance
Name of Project)

plicable local, state and federal codes, rules, and regulations, and that his/her signature and
have been affixed to all calculations and drawings used in, and resulting from, the design.

signed hereby agrees to make all original design drawings and calculations available to the

____
(Insert Name of Owner)

s representative within seven days following written request therefor by the Owner.

___________________________ ___________________________________
e Contractor's Name

___________________________ ___________________________________
Signature

___________________________ ___________________________________
Title

____
Address

SECTION 01500

TEMPORARY FACILITIES

GENERAL

TEMPORARY OFFICES

Temporary offices shall be established on the job site where approved or directed by the Engineer, adequately furnished, and maintained in a clean, orderly condition by the Contractor. The Contractor or an authorized representative shall be present in the field office at all times while work is in progress. Instructions received there from the Engineer shall be considered as delivered to the Contractor.

Provide either a separate building or a partitioned-off space of at least 200 sq ft of floor space in Contractor's building for the exclusive use of the Engineer throughout the period of construction. The temporary office shall be weathertight, have a tight floor at least 8-in off the ground and shall be insulated all around with rigid insulation board not less than 1/2-in thick and suitably ventilated. The office shall have at least three screened windows capable of being opened, a screen door and a solid door provided with cylinder lock and three keys. The office shall be provided with janitor service, heating equipment, electrical wiring, outlets and fixtures suitable to light the tables and desk adequately as directed. Provide separate toilet facilities for the exclusive use of the Engineer.

Provide the following furniture and equipment in the Engineer's office:

1. One plan table, 3-ft by 5-ft and one stool
2. Desk about 3-ft by 5-ft with desk chair
3. Three additional chairs
4. Plan rack, as directed
5. Shelves, as directed
6. Four-drawer, filing cabinet with lock
7. Coat rack and hooks
8. Desk calculator
9. Air Conditioner (12,000 BTU)
10. Duplicating machine, Xerox Model 1025 I or equal.
11. One conference table (6-ft).
12. Eight folding chairs.

13. First aid kit suitable for ten people with manual, American White Cross No. K10

D. Supply all fuel for heating and pay all electrical bills.

E. An approved, suitably constructed and equipped trailer of proper size may be furnishe Engineer's office.

1.02 TEMPORARY TELEPHONE

A. Install a private telephone in the field office. Pay all bills charged against the telepho including installation charge and all monthly charges throughout the construction peri

B. Provide the telephone with an automatic telephone answering device to record messag the office is not manned.

1.03 TEMPORARY LIGHT AND POWER

A. Furnish temporary light and power, including 220 Volt service for welding, complete wiring, lamps and similar equipment as required to adequately light all work areas an sufficient power capacity to meet the reasonable needs of all subcontractors. Make al necessary arrangements with the local electric company for temporary electric service all expenses in connection therewith.

B. Provide connections to existing facilities sized to provide service required for power a lighting. (Owner will pay the costs of power used.) (Contractor shall pay the cost of p used.)

C. Install circuit and branch wiring with area distribution boxes located so that power an is available throughout the site by use of construction type power cords.

D. Provide properly configured NEMA polarized outlets to prevent insertion of 110-120 plugs into higher voltage outlets. For connection of power tools and equipment, prov equipped with ground-fault circuit interrupters, reset button and pilot light.

E. Provide grounded extension cords. Use "hard-service" cords where exposed to abrasi traffic. Provide waterproof connectors to connect separate lengths of electric cords if one length is required.

F. Provide general service incandescent lamps as required for adequate illumination. Pr guard cages or tempered glass enclosures where exposed to breakage. Provide exteri where exposed to moisture.

1.04 TEMPORARY HEAT

A. Provide all heat as may be necessary for thawing out and heating the ground or mater for proper execution, protection and drying out the of work.

WEATHER PROTECTION

Furnish, install and maintain temporary heat and enclosures to provide adequate working areas for personnel during the months of November through March.

Furnish temporary heating units shall have been tested and labeled by UL, FM, or other recognized association related to the type of fuel being used, and maintain reasonable temperatures within the temporary enclosures.

Provisions for weather protection shall be in accordance with c.149, section 44G.

TEMPORARY AIR, STEAM AND WATER

Provide all air, steam and water, including temporary piping and appurtenances required for cleaning and testing pipelines and equipment. Remove temporary piping and appurtenances upon approval of equipment being tested.

TEMPORARY SANITARY FACILITIES

Provide self-contained, single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed in a fiberglass or other approved non-absorbent shell.

FIRE EXTINGUISHERS

Provide portable UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide portable UL-rated Class ABC dry chemical extinguishers or a combination of NFPA recommended Classes for the exposure. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

END OF SECTION

SECTION 01562

DUST CONTROL

GENERAL

SCOPE OF WORK

Perform dust control operations, in an approved manner, whenever necessary or when directed by the Engineer, even though other work on the project may be suspended. Dust control shall be generally accomplished by the use of water; however, the use of calcium chloride may be used when necessary to control dust nuisance.

Calcium chloride shall conform to AASHTO M144, Type I except the requirements for "total alkali chlorides" and other impurities shall not apply.

Methods of controlling dust shall meet all air pollutant standards as set forth by Federal and State regulatory agencies.

END OF SECTION

SECTION 01576

POLICING

ENERAL

COPE OF WORK

Vhen, in the opinion of the Owner, or the Engineer, public safety or convenience requires the ervices of police, the Engineer may direct the Contractor to provide manpower to direct traffic ithin the location of work under this Contract.

Vhen so directed, make all arrangements in obtaining the manpower and all invoices for olicing will be made to the Contractor and the Contractor shall pay all expenses incurred, cluding the salaries of the assigned personnel.

he intent is to insure public safety by police direction of traffic. Police are not to serve as atchmen to protect the Contractor's equipment and materials, or to warn pedestrians of such azards as open trenches.

lothing contained herein shall be construed as relieving the Contractor of any of his/her esponsibilities for protection of persons and property under the terms of the Contract.

he Policing shall be paid for on a weekly basis in accordance with an invoice from the Police epartment, with payment sent directly to the Police Department.

ll payments to police under this Contract shall be in accordance with Section 34B of Chapter 49 of the General Laws of the Commonwealth of Massachusetts which states that reserve olice officers shall receive the same prevailing wage rate as paid to regular officers.

se of police shall be in conformance with Policy Memorandum No. CG-15 in the upplementary Conditions.

END OF SECTION

SECTION 01580

PROJECT IDENTIFICATION AND SIGNS

GENERAL

REQUIREMENTS

Furnish, install and maintain project identification sign.

Remove sign on completion of construction.

Allow no other signs to be displayed.

RELATED WORK

Section 06100: Rough Carpentry.

SUBMITTALS

In accordance with the requirements of Section 01300.

PROJECT IDENTIFICATION SIGN

One painted sign, of not less than 32 square feet (3 square meters) area, with painted graphic content to include:

1. Title of Project.
2. Name of Owner.
3. Names and titles of authorities:
4. Names and title of:
    a. Engineer.
    b. Professional Consultants.
5. Prime Contractor.
6. Major subcontractors.

Graphic design, style of lettering and colors: As approved by the Engineer and subject to the approval of the local Community Appearance Board (CAB) or its equivalent and applicable ocal regulations for signs.

Erect on the site at a lighted location of high public visibility, adjacent to main entrance to site, as approved by the Engineer and the Owner.

1.05 INFORMATIONAL SIGNS

A. Painted signs with painted lettering, or standard products.

1. Size of signs and lettering: as required by regulatory agencies, or as appropriate t

2. Colors: as required by regulatory agencies, otherwise of uniform colors througho Project.

B. Erect at appropriate location to provide required information.

1.06 QUALITY ASSURANCE

A. Sign Painter: Professional Experience in type of work required.

B. Finishes, Painting: Adequate to resist weathering and fading for scheduled constructio

PART 2 PRODUCTS

2.01 SIGN MATERIALS

A. Structure and Framing: May be new or used, wood or metal, in sound condition structu adequate to work and suitable for specified finish.

B. Sign Surfaces: Exterior softwood plywood with medium density overlay, standard larg minimize joints.

1. Thickness: As required by standards to span framing members, to provide even, s surface without waves or buckles.

C. Rough Hardware: Galvanized

D. Paint: Exterior quality, as specified in Division 9.

1. Use Bulletin colors for graphics.

2. Colors for structure, framing, sign surfaces and graphics: As selected by the Engi

PART 3 EXECUTION

3.01 PROJECT IDENTIFICATION SIGN

A. Paint exposed surfaces of supports, framing and surface material; one coat of primer a coat of exterior paint.

B. Paint graphics in styles, sizes and colors selected.

MAINTENANCE

Maintain signs and supports in a neat, clean condition; repair damages to structure, framing or sign.

REMOVAL

Remove signs, framing, supports and foundations at completion of project.

END OF SECTION

SECTION 02050

DEMOLITION

GENERAL

SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required for demolition, renovation, removal and disposal work as shown on the Drawings and as specified herein.

Included, but not limited to, are demolition and removals of existing materials, equipment, or work necessary to install the new work as shown on the Drawings and as specified herein. Demolition may include stop log structures, structural concrete, foundations, structural steel, metals, masonry, attachments, appurtenances, piping, electrical and mechanical equipment, paving, curbs, walks, fencing and other existing facilities.

Demolitions and removals which may be specified under other Sections shall conform to the requirements of this Section.

Where applicable, this Section calls attention to certain activities necessary to maintain and facilitate continuous operation of existing facilities during and immediately following construction and does not necessarily cover all of the required activities. Exercise due concern for existing facilities operation and direct all activities toward maintaining continuous operation and minimization of operation inconvenience.

RELATED WORK

Control of work is included in Section 01046.

Site preparation is included in Section 02100.

SUBMITTALS

Submit to the Engineer, in accordance with Section 01300, six copies of proposed schedule of ntended operations for demolition of any existing facilities prior to the start of work. Include n the schedule the coordination of shutoff, capping and continuation of utility services as required.

Furnish a detailed sequence of demolition and removal work to ensure the uninterrupted operation of the Owner's facilities.

Before the start of demolition work, all modifications necessary to bypass the affected structure will be completed. Actual work will not begin until the Engineer has inspected, reviewed and authorized the start of the demolition work, in writing.

The above procedure must be followed for each individual demolition operation.

1.04 CONDITION OF STRUCTURES

A. The Owner and the Engineer assume no responsibility for the actual condition of any to be demolished or modified.

B. Conditions existing at the time of inspection for bidding purposes will be maintained Owner insofar as practicable. However, variations within a structure may occur prior start of demolition work.

1.05 RULES AND REGULATIONS

A. Determine the applicability and file notifications to the appropriate agencies with rega demolition work that requires clearances for asbestos containing materials (ACMs) ha any other materials requiring special management. It should be noted that, in any dem event, notifications must be filed in accordance with the National Emission Standards Hazardous Air Pollutants (NESHAPS) as described in 40 CFR Part 61, Subpart M.

B. No building or structure, or any part thereof, shall be demolished until an application filed with the appropriate building department and a permit issued. Any fee for this p be the Contractor's responsibility.

1.06 DISPOSAL OF MATERIAL

A. Where directed by the Engineer, salvageable material and equipment listed below shal the property of the Owner. Dismantle all such items to a size that can be readily hand and store on or adjacent to the site in a protected place specified by the Engineer or lo trucks provided by the Owner.

B. Concrete, concrete block and excess bricks shall be disposed of as specified in PART

C. The storage or sale of removed items will not be allowed on the site.

1.07 TRAFFIC AND ACCESS

A. Conduct demolition and the removal of equipment and debris to ensure minimum inte with occupied or used facilities.

B. Special attention is directed towards maintaining safe and convenient access to any ex facilities by personnel and vehicles.

C. Do not close or obstruct accesses to used facilities without permission from the Engin Furnish alternate routes around closed or obstructed access ways.

1.08 PROTECTION

A. Conduct operations to minimize damage by falling debris or other causes to adjacent Furnish interior and exterior shoring, bracing, or support to prevent the movement, se or collapse of structures to be demolished and adjacent facilities to remain.

Exercise precautions for fire prevention. Acceptable fire extinguishing apparatus shall be available at all times in areas where demolition work is being performed using burning torches. Burning of demolition debris shall not be permitted on or near the site.

DAMAGE

Promptly repair damage caused to adjacent facilities by demolition operations as directed by the Engineer and at no cost to the Owner. Repairs shall be made to a condition equal or better than that which existed prior to construction.

UTILITIES

Maintain existing utilities in service and protect against damage during demolition operations.

Do not interrupt existing utilities serving occupied or used facilities, except when authorized by the Engineer. Furnish temporary services acceptable to the Engineer during interruptions to existing utilities.

Assist the Owner in shutting off utilities required for the performance of demolition operations.

Be solely responsible for making all necessary arrangements and for performing any necessary work involved in connection with the discontinuance or interruption of all utilities or services under the jurisdiction of the public and private utility companies.
All utilities being abandoned shall be disconnected and terminated at the service mains in conformance with the requirements of the utility companies or the municipality owning or controlling them.

DUST AND NOISE CONTROL

Take all measures necessary to minimize the amount of dust and noise resulting from demolition activity.

QUALIFICATIONS

The removal of buried fuel oil storage tanks shall be undertaken by a State Certified Pollutant Storage System Contractor (PSSC).

The asbestos contractor shall be licensed to work with ACMs by the State.

PRODUCTS

MATERIALS

All materials or items of equipment required for the performance of the work of this Section shall be suitable for the intended purpose and shall be equal, where applicable, to similar items and materials specified in other Sections of Divisions 2 through 16.

PART 3 EXECUTION

3.01 SEQUENCE OF WORK

A. The sequence of demolition and, where applicable, modifications to existing facilities in accordance with the schedule submitted in accordance with Paragraph 1.03 above.

3.02 REMOVAL OF EXISTING PROCESS EQUIPMENT, PIPING AND APPURTENAN

A. Subject to the constraints of maintaining the existing facilities in operation and prior t demolition, existing process equipment, non-buried valving, piping and appurtenance necessary for the operation of the new facilities shall be removed.

B. All equipment, piping and appurtenances shall be cleaned, flushed and drained. Equi be retained by the Owner, as previously specified, shall be dismantled sufficiently anc thoroughly cleaned and drained. All valves shall be left open. All discontinued pipin capped and sleeves and openings remaining after removal of the existing equipment, appurtenances shall be plugged and sealed as shown on the Drawings and as directed Engineer.

3.03 DEMOLITION

A. Survey the condition of the Stop Log Structure to determine whether removing any el might result in structural deficiency or unplanned collapse of any portion of the struct adjacent structures during selective demolition.

B. Wet down work during demolition operations to prevent dust from arising. Furnish pr from inclement weather for materials, equipment and personnel located in partially di structures.

C. Existing, below grade slabs to be abandoned but not demolished shall have holes cut t for positive drainage and the prevention of flotation.

D. Remove all existing work as indicated on the Drawings or as required and prepare adj areas for installation of the proposed work or for blocking up and filling in of existing openings.

E. All demolition debris shall become the property of the Contractor and shall be remove the site and disposed off the site in conformance with all applicable laws and regulati Demolition debris shall not be used for fill or backfill.

F. Blasting or the use of explosives will not be allowed for demolition work.

G. Remove from the site all debris resulting from the demolition operations as it accumu Upon completion of the work, all materials, equipment, waste and debris of every sor removed and the premises shall be left clean, neat and orderly.

MISCELLANEOUS CONCRETE SLABS AND SIDEWALKS

Remove miscellaneous concrete slabs and sidewalks where shown on the Drawings or where necessary for the construction of new structures or modifications of existing structures. All concrete sidewalks and curbing not required after the new work is constructed shall be removed and disposed of as specified herein.

END OF SECTION

SECTION 02100

SITE PREPARATION

GENERAL

SCOPE OF WORK

Furnish all labor, materials and equipment required and perform all site preparation, complete as shown on the Drawings and as specified herein.

Unless otherwise directed by the Engineer, the areas to be cleared, grubbed and stripped shall generally consist of the Charlesgate Staging Area, with the exception of those areas specifically designated to remain in an undisturbed, natural condition.

RELATED WORK

Demolition is included in Section 02050.

Environmental Protection is included in Section 01110.

SUBMITTALS

Submit to the Engineer, in accordance with Section 01300, copies of all permits required prior to clearing, grubbing, and stripping work.

PRODUCTS (NOT USED)

EXECUTION

CLEARING

Cut and remove all timber, trees, stumps, brush, shrubs, roots, grass, weeds, rubbish and any other objectionable material resting on or protruding through the surface of the ground.

Preserve and protect trees and other vegetation designated on the Drawings or directed by the Engineer to remain as specified below.

GRUBBING

Grub and remove all stumps, roots in excess of 1-1/2-in in diameter, matted roots, brush, timber, logs, concrete rubble and other debris encountered to a depth of 18-in below original grade or 18-in beneath the bottom of foundations, whichever is deeper.

Refill all grubbing holes and depressions excavated below the original ground surface with suitable materials and compact to a density conforming to the surrounding ground surface in accordance with Section 02200.

3.03 STRIPPING

A. Strip topsoil from all areas to be occupied by buildings, structures, and roadways anc to be excavated or filled.

B. Topsoil shall be free from brush, trash, large stones and other extraneous material. A mixing topsoil with subsoil.

C. Stockpile and protect topsoil until it is used in landscaping, loaming and seeding ope Dispose of surplus topsoil after all work is completed.

3.04 DISPOSAL

A. Cut tree trunks and limbs exceeding 4-in in diameter shall be cut into 4-ft lengths anc on site in the area designated on the Drawings.

B. Dispose of material and debris from site preparation operations by hauling such mate debris to an approved offsite disposal area. No rubbish or debris of any kind shall be the site.

C. Burning of cleared and grubbed materials, or other fires for any reason will not be pe

3.05 PROTECTION

A. Trees and other vegetation designated on the Drawings or directed by the Engineer to shall be protected from damage by all construction operations by erecting suitable ba guards and enclosures, or by other approved means. Conduct clearing operations in prevent falling trees from damaging trees and vegetation designated to remain and to being constructed and so as to provide for the safety of employees and others.

B. Maintain protection until all work in the vicinity of the work being protected has bee completed.

C. Do not operate heavy equipment or stockpile materials within the branch spread of e trees.

D. Immediately repair any damage to existing tree crowns, trunks, or root systems. Roo and/or damaged during the work shall immediately be cut off cleanly inside the expo damaged area. Treat cut surfaces with an acceptable tree wound paint and topsoil sp the exposed root area.

E. When work is completed, remove all dead and downed trees. Live trees shall be trim dead and diseased limbs and branches. All cuts shall be cleanly made at their junctu trunk or preceding branch without injury to the trunk or remaining branches. Cuts o diameter shall be treated with an acceptable tree wound paint.

F. Restrict construction activities to those areas within the limits of construction design Drawings, within public rights-of-way, and within easements provided by the Owner properties and improvements thereon, public or private, which become damaged by construction operations shall be promptly restored to their original condition, to the full satisfaction of the property owner.

END OF SECTION

SECTION 02120

TRANSPORTATION AND DISPOSAL OF CONTAMINATED MATERIAL

GENERAL

SCOPE OF WORK

Furnish all labor, material, tools and equipment necessary for the transportation and disposal of contaminated soil and other materials.

Reuse/Dispose of Deposited Sediment at In-State Unlined and Lined Landfills and Out-of-State Commercial Landfills.

RELATED WORK

Submittals is included in Section 01300.

Dredging and Dewatering/Drying of Dredge Material is included in Section 02482.

SUBMITTALS

Submit, in accordance with Section 01300, as a single submittal, all pertinent information relating to the transport and disposal of materials specified herein, within 14 days after issuance of the Notice to Proceed. The information submitted shall include, as a minimum:

1. Name and address of all hazardous material transporters to be used to complete project.
2. Massachusetts Department of Transportation Transporter Identification Number and expiration date.
3. Proof of permit, license, or authorization to transport hazardous material in all affected states.
4. Soil recycling/asphalt batch information described in Paragraph 3.03.
5. Landfill information described in Paragraph 3.05.
6. Soil reuse information described in Paragraph 3.04.

DEFINITIONS

Out-of-State Commercial Landfill - This type of landfill shall be state approved or permitted to accept soil that is defined as a hazardous material in 310 CMR 30.00, but is not classified as either a RCRA characteristic waste or RCRA listed waste as defined in 40 CFR Part 261; soil containing PCBs below 50 ppm; and all other soil not permitted or unsuitable for in-state disposal or recycling.

B. In-State Unlined and Lined Landfill - This type of facility shall be approved by the Commonwealth of Massachusetts to accept soil that is classified as petroleum contam soil, that would be classified as a hazardous material in 310 CMR 30.00 if not manag M.G.L. c.21 E and 310 CMR 40.00; and is not classified as a RCRA characteristic wa RCRA listed waste as defined in 40 CFR Part 261.

C. Deposited Sediment - Sediment removed from river channel and from within culverts

1.05 REGULATORY REQUIREMENTS

A. The Work of this Section shall be performed in accordance with all applicable Federa and local regulations, laws, codes, and ordinances governing the handling, transportat disposal of hazardous material.

B. Obtain all Federal, State and local permits required for the transport and disposal of contaminated soil. The Contractor shall adhere to all permit requirements.

C. Document that the disposal facilities proposed have all certifications and permits as re Federal, State and local regulatory agencies to receive and dispose of the contaminate

PART 2 PRODUCTS

2.01 GENERAL

A. All Contractor personnel shall wear personal protective equipment and protective clot consistent with the levels of protection for this Work as indicated in the Site Health ar Plan described in Section 13740.

PART 3 EXECUTION

3.01 GENERAL

A. The Owner will be the generator and will sign all manifests and MADEP bills of ladir Contractor shall prepare a summary of analytical data as part of bill of lading package lading will be prepared by the Contractor and may be subject to MADEP review and The Engineer will provide LSP Services and approve all bills of lading prior to transp

3.02 SOIL CHARACTERIZATION

A. The Contractor shall be responsible for characterizing the soil for the purpose of obtai approvals for final disposal of contaminated material. Collect soil samples to perform required by the disposal facility.

1. Submit a copy of all analytical results to the Engineer within two days of receipt laboratory report. Analytical data shall be kept confidential, and distributed to th Engineer and the MADEP only. Engineer's review of data will be two days.

B. Sampling of contaminated soil shall be done at sufficient and adequately distributed l so that the concentrations of the chemical constituents attributable to the petroleum re any other contaminants of concern which may be present are adequately characterize

Coordinate schedule so that Engineer may observe sample collection.

SOIL REUSE AT UNLINED AND LINED LANDFILLS

Deposited Sediment that exhibits concentrations equal to or below de minimus levels listed below and satisfy the physical requirements for landfill reuse and do not need specific DEP approval, may be transported to a lined landfill using the bill of lading procedures.

Contaminant	Lined Landfill Reuse Levels (mg/kg)	Unlined Landfill Reuse Levels (mg/kg)
Total Arsenic	40	40
Total Cadmium	80	30
Total Chromium	1,000	1,000
Total Lead	2,000	1,000
Total Mercury	10	10
Total Petroleum Hydrocarbons	5,000	2,500
Total PCBs	< 2	< 2
Total PAHs	100	100
Total VOCs	10	4
Conductivity (umhos/cm)	8,000	4,000
Listed or Characteristic Hazardous Waste (TCLP)	None	None

eposited sediment reuse shall consist of daily cover, intermediate cover, and pre-cap ontouring material.

eposited sediment which exceed the chemical criteria listed above or contain concentrations of il and/or hazardous materials for which no threshold is specified, may be reused at an unlined r lined landfill upon approval by MADEP Division of Solid Waste Management. The ontractor shall be responsible for obtaining this approval at no additional cost to the Owner. pproval in writing shall be obtained from DEP and provided to Engineer for review prior to ransport of soil.

ANDFILL

dentify two landfills that are permitted to and will accept the type of deposited sediment pecified in this Contract for disposal.

elect landfills that are established, fully operational, and in full compliance with all applicable ederal, State, and local regulations.

esignate one landfill as the primary facility and the other as the alternate facility should roject conditions require the use of a back-up facility. The Owner will not incur any additional osts if an alternate facility is utilized.

ubmit to Owner and the Engineer initial approvals or letters of intent and facility information or the landfills selected, within 14 Days of issuance of the Notice to Proceed. The facility nformation shall include the following:

1. General Information
    a. Facility Name
    b. Facility Address
    c. Name of Contact Person
    d. Title of Contact Person
    e. Telephone Number of Contact Person.
    f. Permit Number.
2. The landfills shall specify the volume of material that can be accepted from the s weekly and a total basis.
3. The landfills shall provide written confirmation that they are permitted to accept accept the classified soil of the general quality and quantity described by this Se
4. The landfills shall provide a listing of all current and valid permits, licenses, lett approval, and other authorizations to operate that they hold, pertaining to the rec management of the soils or materials specified in this Contract.
5. Submit a complete list of the disposal/landfill facility's permitted allowable cont levels and physical characteristic requirements for contaminated material, and li required regulatory approvals for individual waste streams.

E. Obtain and submit documentation of MADEP Division of Solid Waste Management for the disposal of contaminated soil at a landfill.

3.06 WASTE PROFILES AND MANIFESTS

A. Prepare and submit to the Engineer for review all waste profile applications and quest and coordinate with disposal facilities and all Federal and State Environmental Agenc

B. Prepare all hazardous material manifests and 21E bills of lading with all applicable ar backup, notification, and control forms. Submit these to the Engineer for review at le before transport. The Engineer will provide LSP signature for bill of ladings.

C. Provide certified tare and gross weight slips for each load received at the designated f which shall be attached to each returned manifest and bill of lading.

D. The Owner will be designated as generator and will sign all manifests, bills of lading profile application or questionnaires.

E. Furnish all generator copies of the hazardous material manifest to the Engineer for su the appropriate State Environmental Agencies and to retain for the Owner's records.

Submit to Owner and the Engineer, prior to receiving progress payment, documentation certifying that all materials were transported to, accepted, and disposed of, at the selected disposal facility. The documentation shall include the following, as a minimum.

1. Documentation shall be provided for each load from the site to the disposal facility, including all manifests and any other transfer documentation as applicable.

2 All documentation for each load shall be tracked by the original manifest document number that was assigned by the Engineer at the site.

TRANSPORT OF CONTAMINATED MATERIAL

The Contractor shall not be permitted to transport deposited sediment off-site until all disposal or recycling facility documentation has been received, reviewed, and accepted by Owner and he Engineer.

Transport deposited sediment from the site to the disposal or recycling facility in accordance with all United States Department of Transportation (DOT), USEPA, MADEP regulations and other regulations of all affected states.

The hauler(s) shall be licensed in all states affected by transport.

Provide to the Engineer copies of all weight slips, both tare and gross, for every load weighed nd disposed of at the accepted disposal facility. The slips shall be tracked by the original manifest document number that was assigned by the Engineer at the site. The Owner shall only make progress payments upon receipt of these weight slips.

The Contractor shall be responsible for ensuring that free-liquid does not develop during ransport. "Wet sediment" shall not be loaded for transport. The Contractor shall be responsible o properly dispose of any free liquids that may result during transportation.

END OF SECTION

SECTION 02270

EROSION AND SEDIMENTATION CONTROL

GENERAL

SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required and perform all installation, maintenance, removal and area cleanup related to erosion and sedimentation control work as shown on the Drawings and as specified herein. The work shall include, but not necessarily be limited to; installation of temporary access ways and staging areas, silt fences, stone filter boxes, stone filter berms, sediment removal and disposal, device maintenance, removal of temporary devices, temporary mulching, excelsior matting installation and final cleanup.

RELATED WORK

Dust control is included in Section 02250.

SUBMITTALS

Submit to the Engineer, in accordance with Section 01300, within 10 days after award of Contract, technical product literature for all commercial products to be used for erosion and sedimentation control.

QUALITY ASSURANCE

Be responsible for the timely installation and maintenance of all sedimentation control devices necessary to prevent the movement of sediment from the construction site to off site areas or into the stream system via surface runoff or underground drainage systems. Measures in addition to those shown on the Drawings necessary to prevent the movement of sediment off site shall be installed, maintained, removed, and cleaned up at the expense of the Contractor. No additional charges to the Owner will be considered.

Sedimentation and erosion control measures shall conform to the requirements outlined in the Conservation Commission Order of Conditions appended to this Section.

PRODUCTS

MATERIALS

Crushed stone for sediment filtration devices, access ways and staging areas shall conform to Mass Highway "Standards and Specifications for Highway and Bridges" Section M2.01.3.

Berm structural stone shall be rip-rap as follows:

1. Rip-rap shall be sound, durable rock which is roughly rectangular shape and of suitable quality to insure permanence in the condition in which it is to be used. Rounded stones, boulders, sandstone or similar soft stone will not be acceptable. Material shall be free

from overburden, spoil, shale and organic material, meet the Engineer's approval well graded within the following limits:

Weight of Stone	Percent Finer by Weight
40 lb	100
12 lb	50
3 lb	0

C. Sediment Fence

1. Sediment fence shall be a prefabricated commercial product made of a woven, polypropylene, ultraviolet resistant material such as “Envirofence” by Mirafi Inc Charlotte, NC or equal.

D. 1/4-in woven wire mesh for filter boxes shall be galvanized steel or hardware cloth.

E. Straw mulch shall be utilized on all newly graded areas to protect areas against washo erosion. Straw mulch shall be comprised of threshed straw of oats, wheat, barley, or free from noxious weeds, mold or other objectionable material. The straw mulch sha at least 50 percent by weight of material to be 10-in or longer. Straw shall be in an ai condition and suitable for placement with blower equipment.

F. Latex acrylic copolymer, such as Soil Sealant with coalescing agent by Soil Stabilizat Merced, CA or equivalent shall be used as straw mulch tackifier.

G. An asphalt tackifier shall only be used when temperatures are too low to allow the us acrylic copolymer and only with prior written approval from the Engineer.

H. Erosion control blanket shall be installed in all seeded drainage swales and ditches as the Drawings or as directed by the Engineer. Erosion control blanket shall be 100 per agricultural straw matrix stitch bonded with degradable thread between two photodeg polypropylene nettings, such as Model S150 Double Net Short-Term Blanket (10 mo North American Green, Evansville, IN or equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. Sediment Fence Installation

1. Sediment fences shall be positioned as indicated on the Drawings and as necessa prevent off site movement of sediment produced by construction activities as dir the Engineer.

2. Dig trench approximately 6-in wide and 6-in deep along proposed fence lines.

3. Drive stakes, 8-ft on center (maximum) at back edge of trenches. Stakes shall b ft (minimum) into ground.

4. Hang filter fabric on posts carrying to bottom of trench with about 4-in of fabric laid across bottom of trench. Stretch fabric fairly taut along fence length and maintain secure both ways.

5. Backfill trench with excavated material and tamp.

6. Install pre-fabricated silt fence according to manufacturer's instructions.

Construct filter boxes as detailed on the Drawings, from 1/4-in woven wire mesh or hardware cloth and wood. Fill with crushed stone and place over all drop inlets and manholes to storm drain system as each inlet is completed. This should be done prior to setting casting, if there is a delay between installation of inlet structures or drain manholes and setting of castings. An alternate method is to ring each inlet with a sediment fence.

Stone Filter Berm Installation

1. Place berm structural stone across channel just below lower sandbag wall at work area. Face upstream side of structural berm with crushed stone.

Staging areas and access ways shall be surfaced with a minimum depth of 4-in of crushed stone.

MAINTENANCE AND INSPECTIONS

Inspections

1. Make a visual inspection of all erosion and sedimentation control devices once per week and promptly after every rainstorm. If such inspection reveals that additional measures are needed to prevent movement of sediment to offsite areas or into the vent trench, promptly install additional devices as needed. Sediment controls in need of maintenance shall be repaired promptly.

Device Maintenance

1. Sediment Fences
    a. Remove accumulated sediment once it builds up to 1/2 of the height of the fabric.
    b. Replace damaged fabric, or patch with a 2-ft minimum overlap.
    c. Make other repairs as necessary to ensure that the fence is filtering all runoff directed to the fence.
2. Filter Boxes
    a. Replace crushed stone when it becomes saturated with silt.
3. Stone Filter Berm
    a. Muck out trapped silt from dewatering operations when it has built up to within 6-in of the top of the berm.

    b. Replace crushed stone filter when saturated with silt.

4. Add crushed stone to access ways and staging area as necessary to maintain a fi free of ruts and mudholes.

3.03 TEMPORARY MULCHING

A. Apply temporary mulch to areas where rough grading has been completed but final g not anticipated to begin within 30 days of the completion of rough grading.

B. Straw mulch shall be applied at rate of 100 lbs/1000 sq ft and tackified with latex acr copolymer at a rate of 1 gal/1000 sq ft diluted in a ratio of 30 parts water to 1 part lat copolymer mix.

3.04 EROSION CONTROL BLANKETS

A. Erosion control blankets shall be installed in all seeded drainage swales and ditches a on the Drawings and as directed by the Engineer in accordance with manufacturer's instructions. The area to be covered shall be properly prepared, fertilized and seeded permanent vegetation before the blanket is applied. When the blanket is unrolled, the shall be on top and the fibers in contact with the soil over the entire area. The blanke applied in the direction of water flow and stapled. Blankets shall be placed a minimu rows (of 4-ft) wide (total approx. 12-ft width) within the drainage swale/ditch and sta together in accordance with manufacturer's instructions. Side overlaps shall be 4-in r The staples shall be made of wire, .091-in in diameter or greater, "U" shaped with leg length and a 1-1/2-in crown. Commercial biodegradable stakes may also be used wit approval by the Engineer. The staples shall be driven vertically into the ground, spac approximately two linear feet apart, on each side, and one row in the center alternatel between each size. Upper and lower ends of the matting shall be buried to a depth of trench. Erosion stops shall be created every 25-ft by making a fold in the fabric and the fold into a silt trench across the full width of the blanket. The bottom of the fold 4-in below the ground surface. Staple on both sides of fold. Where the matting must more than one roll length is required in the swale, turn down upper end of downstrea a slit trench to a depth of 4-in. Overlap lower end of upstream roll 4-in past edge of downstream roll and staple.

1. To ensure full contact with soil surface, roll matting with a roller weighing 100 width perpendicular to flow direction after seeding, placing matting and stapling Thoroughly inspect channel after completion. Correct any areas where matting present a smooth surface in full contact with the soil below.

3.05 REMOVAL AND FINAL CLEANUP

A. Once the site has been fully stabilized against erosion, remove sediment control devi accumulated silt. Dispose of silt and waste materials in proper manner. Regrade all disturbed during this process and stabilize against erosion with surfacing materials as on the Drawings.

END OF SECTION

SECTION 02482

DREDGING AND DEWATERING/DRYING OF DREDGED MATERIAL

GENERAL

SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals necessary and perform all dredging of he Charlesgate section of the Muddy River and dewatering and drying of dredged material as shown on the Drawings and as specified herein.

RELATED WORK

Environmental protection requirements are included in Section 01110.

Site preparation is included in Section 02100.

Sedimentation and erosion control is included in Section 02270.

SUBMITTALS

Submit to the Engineer, in accordance with Section 01300, copies of all documentation required o establish compliance with the Contract Documents. Submittals shall include at least the following:

. A work plan for the proposed work shall be submitted within 30 days of the Notice to Proceed. The work plan shall include descriptions of all methods, materials, equipment and incidentals being proposed to perform all the work as shown on the Drawings and as specified herein. Do not proceed any further until written approval of work plan has be received.

. Technical product literature for all products to be used in the work.

. Drawings showing the proposed drying/containment areas, identifying all access points, equipment and piping.

REFERENCE STANDARDS

American Society for Testing and Materials (ASTM)

. ASTM D1557 - Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/f (2,700kN-m/m).

. ASTM D1777 - Standard Test Method for Thickness of Textile Materials.

. ASTM D3776 - Standard Test Methods for Mass Per Unit Area (Weight) of Fabric.

4. ASTM D4491 - Standard Test Methods for Water Permeability of Geotextiles b Permittivity.

5. ASTM D4637 - Standard Specification for EPDM Sheet Used in Single-Ply Roo Membrane.

6. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size Geotextile.

7. ASTM D4833 - Standard Test Method for Index Puncture Resistance of Geotext Geomembranes and Related Products.

B. Where reference is made to one of the above standards, the revision in effect at the ti opening shall apply.

1.05 QUALITY ASSURANCE

A. Be responsible for the timely installation and maintenance of all sedimentation and e control measures and all turbidity control curtains necessary to perform all dredging, dewatering and drying of dredged material and disposal of dried material as specified shown on the Drawings. Measures in addition to those shown on the Drawings shall installed, maintained, removed and cleaned up at the expense of the Contractor.

B. All measures and methods shall conform to the requirements outlined in the Order of Conditions appended to this Section.

PART 2 PRODUCTS

2.01 TURBIDITY CONTROL CURTAIN

A. Turbidity control curtain shall consist of flexible polyester reinforced vinyl filter fabr dielectrically welded to provide an upper hem for enclosing flotation material and a l for enclosing ballast material. Adequate flotation and ballast shall be provided for ea installation. Each curtain shall be made up of one or more sections run from shorelin shoreline, length as required per each installation. Multiple sections shall be connect shackled and bolted load lines with reinforced PVC pipe for watertight fabric closure. Appropriate depth of fabric, flotation material and ballast shall be used for each insta

B. Filter fabric for turbidity control curtains shall meet the following properties:

	Average Physical Property	ASTM Test Method
1. Weight	6.2 oz/yd	D3776
2. Thickness	15 mils	D1777
3. Elongation at Break	28 percent (warp) 24 percent (fill)	D4637

4.	Puncture Strength	180 lbs	D4833
5.	A.O.S. Std. Sieve	70 to 100	D4751
6.	Flow Rate	23 gpm/sq ft	D4491

EXECUTION

TURBIDITY CONTROL CURTAIN INSTALLATION

Turbidity control curtains shall be installed prior to commencing any dredging work. Turbidity curtains shall be used during the entire dredging operation to minimize increases in turbidity outside the area of dredging.

Permanent turbidity control curtains shall be installed where shown on the Drawings. These shall remain in place during the entire period of dredging work and shall be removed only after final acceptance of the dredging work.

Temporary turbidity control curtains shall be installed both upstream and downstream of the dredging work and relocated as the work progresses. Temporary turbidity curtains shall also be nstalled adjacent to wetlands replacement areas to prevent siltation of newly planted areas.

All turbidity control curtains shall extend the full depth of the pond and their depth adjusted as required to match new bottom contours as the dredging work progresses.

The turbidity control curtains shall be maintained in good operating condition during the entire period of dredging work.

DREDGING

Dredging shall strictly conform to the new contours as shown on the Drawings. Care shall be exercised so as not to undercut or otherwise disturb the existing bank areas, except those areas specifically being removed.

Access for dredging work shall be limited to those areas as shown on the Drawings. All bank and wetland areas disturbed by the dredging operations shall be restored to their original condition using materials and methods as specified in Section 02955.

DEWATERING/DRYING OF DREDGED MATERIALS

Mechanical dewatering devices shall be installed in the staging areas. All supernatant shall be discharged at the locations shown on the Drawings. Facilities for treatment of the supernatant shall be provided and maintained. Such facilities shall be adequate to maintain average urbidity levels in the discharge at 50 mg/l and maximum at 100 mg/l. Turbidity measurements of the pond and discharges to the pond will be made by the Engineer on a daily basis.

The dredged material shall be dewatered so that the moisture content is no greater than 20 percent as measured by ASTM D1557, Method D.

3.04 REUSE/DISPOSAL OF EXCAVATED MATERIALS

A. Excavated material shall be removed off site only after it has been dewatered/dried su for transport by truck and classified as to fill type as specified in Section 02200.

3.05 FINAL ACCEPTANCE OF DREDGING WORK

A. A bathometric survey of the river channel and culverts shall be conducted after compl the dredging work. The survey shall be conducted by a registered land surveyor in the Commonwealth of Massachusetts whose work is procured and paid for by the Contrac final bathometric plan shall be prepared using a 25-ft grid system, showing 1-ft contou be prepared and submitted to the Engineer for review and approval.

B. The drying/containment areas and the permanent turbidity control curtains shall not be until the river channel and culverts have been surveyed and the final dredged contours by the Engineer. The Engineer reserves the right to require additional dredging work i Engineer determines that the new contours have not been met.

END OF SECTION

SECTION 02900

LANDSCAPING

GENERAL

SCOPE OF WORK

Furnish all labor, materials, equipment and incidentals required and complete all planting and related landscaping work indicated on the Drawings and as specified herein, including but not necessarily limited to the following:

1. Supplying of loam for all plant pits and planting beds. Be responsible for all topsoil preparation, testing, conditioning and fertilization and shall insure the overall quality of the material. Loam stockpiled from other construction operations under this Section may be used.
2. Excavation of pits for trees and shrub and planting beds.
3. Furnishing and planting trees and shrubs as shown on the Drawings.
4. Supplying accessory materials and wrapping, guying and staking of all trees.
5. Pruning of plant materials as specified and as approved by the Engineer.
6. Supplying and spreading mulch for tree pits and planting beds as specified herein.
7. Furnishing and placing washed gravel.
8. One year maintenance program and guarantee.
9. Final cleanup and all other work required to complete the job in accordance with the Drawings and Specifications.

The planting work and maintenance shall be performed by a landscape contractor who is fully xperienced in projects of this scope and whose main business is landscaping. Selection of the andscape contractor shall be subject to the approval of the Engineer.

RELATED WORK

ite Preparation is included in Section 02100.

edimentation and Erosion Control is included in Section 02270.

SUBMITTALS

ubmit to the Engineer complete product data for all materials furnished under this Section.

ubmit soil test results with the quantity of soil conditioners to be added by the Contractor.

1.04 REFERENCE STANDARDS

A. American Association of Nurserymen (AAN)

1. AAN Z60.1 - Nursery Stock

B. Where reference is made to one of the above standards, the revision in effect at the
opening shall apply.

PART 2 PRODUCTS

2.01 WASHED GRAVEL

A. Washed gravel shall be off-white river washed gravel, clean, granular material grad
1-1/2-in to 3/4-in in size. Washed gravel shall be obtained from natural deposits an
unprocessed except for removal of unacceptable sizes and materials. Washed grave
rounded stone and shall not contain vegetation, roots or other organic matter and sh
washed prior to placing.

B. Deliver to a site (as directed by the Engineer) a sample of washed gravel, which con
the above requirements. After examination and approval by the Engineer, all washe
incorporated into the work shall match the approved samples.

2.02 FERTILIZER, SOIL AND PLANT CONDITIONERS

A. Fertilizer

1. Fertilizer shall be a complete fertilizer, the elements of which are derived from
sources. Fertilizer shall be a standard product complying with Federal and Sta
laws.

2. Percentages of nitrogen, phosphorus and potash shall be based on laboratory te
recommendations as approved by the Engineer. For purpose of bidding, assum
nitrogen, 10 percent phosphorus and 5 percent potash by weight. At least 50 p
total nitrogen shall contain no less than 3 percent water-insoluble nitrogen.

3. Fertilizer shall be delivered to the site, mixed as specified, in the original unop
standard size bags showing weight, analysis and name of manufacturer. Conta
bear the manufacturer's certificate of compliance covering analysis shall be fur
the Engineer.

4. Store fertilizer in a weatherproof place and in such a manner that it will be kep
effectiveness will not be impaired.

B. Manure: Well-rotted, unleached cattle manure, free of harmful chemicals and other
substances. Manure shall be free of sawdust and refuse of any kind and shall not co
than 25 percent of straw, shavings, or other like materials. Manure shall not be mor
years nor less than nine months old.

uper Phosphate: Composed, finely ground phosphate rock as commonly used for agricultural urposes containing not less than 18 percent available phosphoric acid.

eat Moss: Domestic brown sphagnum peat, free of woody materials and of mineral matter uch as sulphur and iron and with a pH value between 4 and 5 delivered air dry.

Veed Retarder: Preen and Green or equal, delivered in manufacturer's containers and used ccording to manufacturer's instructions.

nti-desiccant: Emulsion which provides a protective film over plant surfaces to help retain oisture, but permeable enough to permit transpiration, delivered in the manufacturer's ontainers, mixed with water in proportions recommended by manufacturer, "WILT-PRUF" vailable from Nursery Specialty Products Inc., Greenwich, CT or equal.

one Meal: Commercial raw bone meal, finely ground, having a minimum analysis of 4 ercent nitrogen and 20 percent phosphoric acid.

lulch: Pine Bark Mulch consisting of pine bark strips no longer than 3-in in any dimension, ee of woodchips, stones or other undesirable matter with a pH range between 4 and 5.

CCESSORY MATERIALS

takes

Use for supporting all trees and be of sound wood, uniform in size, reasonably free of knots and capable of standing in the ground at least two years.

Treated with a non-toxic preservative stain with a rich dark brown color. Stakes shall be 2-in by 4-in and not less than 8-ft in length.

Provide a sample for approval by the Engineer.

ire: For tree staking, Double No. 12 or 14 gauge galvanized soft steel wire, twisted.

ose To Encase Wires: two-ply fiber-bearing black rubber garden hose, not less than 1/2-in side diameter and a minimum of 1-ft in length.

rapping Material: heavy waterproof crepe paper manufactured for this purpose. Strips shall 6-in to 10-in wide. Twine for tying shall be coarse sisal yarn.

ee Paint: Waterproof adhesive, elastic and antiseptic paint free from kerosene, coal tar, eosote, or any other material injurious to the life of the tree.

ANT MATERIALS

rnish and install trees and shrubs as shown on the Drawings. Plants shall be nursery grown der climatic conditions similar to those in the locality of the project and shall conform to the riety and sizes indicated. Plants shall conform also to the indicated botanical names and ndards of size, culture and quality for the highest grades and standards as adopted by the AN Z60.1 in the American Standard for Nursery Stock.

B. All plants shall be freshly dug. No heeled-in plants or plants from cold storage sha All plants shall be typical of their species or variety and shall have a normal habit c Plants shall be sound, healthy and vigorous, well-branched and densely foliated wh shall be free of disease, insect pests, eggs or larvae and shall have healthy, well-dev systems. All parts of the plant shall be moist and shall show active green cambium

C. The height of the trees, measured from the crown of the roots to the top of the top b not be less than the minimum size designated and plants within each group shall av mid-point of the size range. Take caliper measurements 6-in above ground for tree caliper and 12-in above ground for trees above 4-in caliper. The trunk of each tree single trunk growing from a single unmutilated crown of roots. No part of the trunl conspicuously crooked as compared with normal trees of the same variety. The tru free from sun-scald, frost cracks, or wounds resulting from abrasions, fire, or other pruning wounds shall be present having a diameter of more than 2-in and such wou show vigorous bark on all edges. Evergreen trees shall be branched to within 1-ft c ground. All evergreen trees shall have a single leader unless otherwise approved b Engineer.

D. Container-Grown Stock shall have been grown in a container long enough for the r to have developed sufficiently to hold its soil together, firm and whole. No plants s loose in the container.

E. Balled and burlapped stock shall be dug with a firm natural ball of earth in which th grown and then wrapped and tied according to AAN Z60.1. Balls shall be drum lac 30-in or greater. Ball size shall be in accordance with AAN Z60.1 for the tree's typ

F. Substitutions: It shall be required that orders for plants not available locally be plac nurseries located out of the state. When plants of kinds or sizes specified are not av substitutions may be made upon written request, if approved by the Engineer.

G. Plants larger than those specified in the plant list may be used, if approved by the E use of such plants shall not increase the Contract Price. If the use of larger plants is the spread of roots or ball of earth shall be increased in proportion to the size of the approved.

2.05 INSPECTION OF PLANT MATERIALS

A. Plants shall be subjected to inspection and approval at the place of growth and upon for conformity to specified requirements as to quality, size and variety. Such appro impair the right of inspection and rejection upon delivery at the site or during the pr the work or at any time up to provisional acceptance.

B. Plants shall be accompanied by State Nursery inspection certificates.

C. Plants shall be inspected before digging at the nursery. Engineer or his representati present for inspection of plants at nursery, and Contractor shall incur all costs assoc the Engineer's travel for plant inspection and tagging. Notify Engineer at least six advance of anticipated planting time to schedule plant inspection and tagging. Prev ensure adequate materials meeting the requirements specified herein are available f by the Engineer.

XECUTION

IGGING, HANDLING AND PROTECTION OF PLANTS

lants shall be dug with firm natural balls of earth, of sufficient diameter and depth to include ıost of the fibrous roots and conforming to the standards of AAN. No plants will be accepted ith plastic burlap or if the ball is cracked or broken except upon special approval of the ngineer.

oots or balls of plants shall be adequately protected at all times from sun and from drying inds.

lants which cannot be planted immediately upon delivery shall be set on the ground and be ell-protected with soil, wet moss, or other acceptable material. Plant materials shall not be ored on site for more than 30 days prior to planting. It is the Contractor's responsibility to ep plants watered and maintained upon delivery to site.

o plant shall be bound with wire or rope at any time so as to damage the bark or break anches.

he Engineer may reject a plant or group of plants at any time during the project.

LANTING SEASONS

anting shall only be done during the periods within the seasons which are normal for such ork as determined by weather and by locally acceptable practice and which are approved by e Engineer.

uring periods of drought, irrigation shall be provided as approved by the Engineer. Water tes shall be equivalent to 1-in of rainfall/week.

ANTING OPERATIONS

anting shall be done by experienced workmen familiar with planting procedures under the pervision of a qualified foreman.

ake out locations of and secure the Engineer's approval before excavating plant pits.

ll plant pits shall be excavated with vertical sides.

ee Pits: Shall be 2-ft greater in diameter than the root ball of the tree and sufficiently deep for root ball. To prevent potential for plant settlement, do not over-excavate under the root ll.

Loam for backfilling all tree pits shall have up to 3 lbs of fertilizer and the topsoil mixture shall consist of 5 parts loam, 2 parts peat moss and 1 part sand (or existing soils if acceptable). Fertilizer amounts shall be adjusted according to soil tests and time of the year when plants occur.

E. Shrub pits shall be 1-ft greater in diameter than the root ball of the plant and suffici to allow for a 1-ft thick layer of compacted loam and peat moss beneath the ball. In the entire bed shall be excavated and prepared, to a depth of 18-in.

1. Loam for backfilling all shrub pits and beds shall have up to 1 lb of fertilizer p and topsoil mixture same as tree and groundcover areas. Fertilizer amount adj trees.

F. Plants shall be set in center of pits plumb and straight and at such a level that after s the crown of the plant ball will be at the surrounding finished grade.

1. When balled and burlapped plants are set, loam shall be compacted around bas to fill all voids. All burlap, ropes or wires shall be removed from the top 1/3 o Plastic burlap shall be completely removed, if accepted by the Engineer.

G. Loam shall be backfilled in layers of not more than 9-in and each layer watered suff settle before the next layer is put in place.

H. Loam around balls shall be thoroughly compacted and watered. Immediately after t is backfilled, a saucer or shallow basin slightly larger than pit shall be formed with soil to facilitate and contain watering.

I. Spray all plants (trees and shrubs) with anti-desiccant, including trunk, branches, fo buds. Follow manufacturer's instructions and recommendations for application of anti-desiccant. Care shall be taken not to spray material on buildings or structures.

3.04 WRAPPING, GUYING AND STAKING

A. Trees shall be inspected by the Engineer for injury to trunks, evidence of insect infe improper pruning before wrapping.

B. Wrap trunks of all deciduous trees spirally from bottom to top with material specifie securely. The wrapping shall overlap and entirely cover the trunk from the ground t of the second branches and shall be neat and snug. Overlap shall be approximately width of the wrap.

3.05 PRUNING, MULCHING AND PLACEMENT OF WASHED GRAVEL

A. Each plant shall be pruned in accordance with AAN standards to preserve the natura of the plant and as directed by the Engineer.

B. Pruning shall be done with clean, sharp tools.

C. Cuts over 1-in in diameter shall be painted with an approved tree paint. Paint shall exposed cambium as well as other exposed living tissue. Paint shall be waterproof, and elastic, antiseptic, free from kerosene, coal tar, creosote, or any other material i the life of the tree.

D. Immediately after planting operations are completed, all tree pits shall be covered w layer of the specified mulch and shrub and groundcover beds shall also be covered v ayer of mulch as specified. Weed retardant shall be applied to all mulched areas in accordance ith manufacturer's instructions.

ashed gravel beds and/or mowing strips shall be installed to a depth of 4-in in areas of lantings and 8-in deep in all other areas as shown on the Drawings. Where washed gravel is ot utilized as a mulch for planting such as mowing strips, pathways and other areas with no lanting, a soil sterilent as approved by the Engineer shall be applied in accordance with anufacturers instructions.

BSTRUCTIONS BELOW GROUND

n the event that underground boulders, underground construction work, or obstructions are ncountered in any pit excavation work under this Contract, alternate locations may be selected y the Engineer at no additional cost to the Owner.

ATERING

lantings must be flooded with water twice within the first 24 hours of the time of planting and ot less than twice per week until provisional acceptance.

uitable water for planting and maintenance will be the responsibility of the Contractor. The ontractor shall furnish his own hose and hose connections or other watering equipment.

AINTENANCE

aintenance for provisional acceptance shall begin immediately after each plant is installed. lants shall be watered, mulched, weeded, pruned, sprayed, fertilized, cultivated and otherwise aintained and protected until provisional acceptance. Settled plants shall be reset to proper ade and position, planting saucer restored and dead material removed. Guys shall be ghtened and repaired. Defective work shall be corrected as soon as possible after it becomes parent and as weather and season permit.

pon completion of planting and prior to provisional acceptance, remove from the site excess il and debris and repair all damage resulting from planting operations.

pon provisional acceptance of the plantings, the Contractor shall begin a formalized two year aintenance program which will last until the end of the guarantee period and final acceptance r all planting which shall include:

Proposed maintenance activities and schedule shall be coordinated with the Owner to avoid conflicts and shall be in accordance with the program submitted by the Contractor at the time of Provisional Acceptance.

Weeding of all washed stone, bark mulch and shrub beds, two times per month during the growing season from 1 April through 1 November (weather permitting). Weeds shall be disposed of off site in an approved manner.

3. Fertilizing all trees and shrub plantings three times during the growing season July and October at the following rates:
    a. Shade trees 3 lbs/tree (10-10-10)
    b. Evergreens and Flowering Trees 2 lbs/tree (10-10-10)
    c. Groundcover 3 lbs/100 sq ft (5-10-10)
    d. Soil tests shall be performed to determine if fertilizer applications should reduced from the stated rates.
4. Application of weed retardant or soil sterilent as appropriate to all washed sto times per year (April and July).
5. Pruning of all trees and shrubs of dead wood and undesirable growth in accord AAN standards as required - Spring and Fall during the 2 year maintenance pe
6. Application of insecticides and other chemicals as required to protect plant gro approved by the Owner.
7. All turf areas adjacent to planting beds shall be edged three times during the g season in late April and early June and early September.
8. All planted areas shall be watered at an average rate of 4-in per month during season with no more than 1-in in any week if rainfall during the period is inad than 1/2-in per week).
9. Prior to the end of the guarantee period after replacement of all plant materials rake and incorporate existing mulch into planting beds and pits and supply and mulch to all planting pits and shrub beds with bark mulch as specified to the f depths:
    a. Shade trees 3-in depth
    b. Evergreen trees 3-in depth
    c. Shrubs 2-in depth
    d. Incorporate weed retardant to the mulch in accordance with the manufactu instructions.
10. Prior to the end of the guarantee period after replacement of all materials as re installation of additional mulch to all planting areas, remove planting stakes a on all plants and dispose of them off site in an approved manner.

3.09 INSPECTION AND PROVISIONAL ACCEPTANCE

A. The Engineer will inspect all work for provisional acceptance upon the written req at least 10 days before the anticipated date of inspection.

urnish full and complete written program for the 2 year maintenance program of the planting o the Owner at the time of provisional acceptance for approval.

fter all necessary corrective work has been completed and a maintenance program has been pproved by the Owner, the Engineer will certify in writing the provisional acceptance of the lanting and the 1 year maintenance program and guarantee period will commence.

AINTENANCE AND GUARANTEE PERIOD AND REPLACEMENTS

ll plants shall be maintained and guaranteed for not less than 2 full years from the time of rovisional acceptance.

t the end of this period, any plant that is missing, dead, not true to name or size as specified, r not in satisfactory growth, as determined by the Engineer, shall be replaced. In case of any uestion regarding the condition and satisfactory establishment of a rejected plant, the ngineer's decision is final.

ll replacements shall be plants of the same kind and size as specified. They shall be furnished d planted as specified herein. The cost of replacement shall be borne by the Contractor shall e responsible for maintenance of all replacement plants for another complete growing season.

INAL INSPECTION AND FINAL ACCEPTANCE

t the end of the maintenance and guarantee period, inspection will be made by the Engineer on written request submitted by the landscape contractor at least 10 days before the nticipated date.

fter all necessary corrective work has been completed, the Engineer will certify in writing the nal acceptance of the planting.

END OF SECTION

SECTION 02901

MISCELLANEOUS WORK AND CLEANUP

ENERAL

COPE OF WORK

urnish all labor, materials, equipment and incidentals required and perform the miscellaneous ork not specified in other sections but obviously necessary for the proper completion of the ork as shown on the Drawings.

hen applicable, perform the work in accordance with other related Sections. When no pplicable specification exists, perform the work in accordance with the best modern practice nd/or as directed by the Engineer.

he work of this Section includes, but is not limited to, the following:

. Restoring driveways and sidewalks.

. Cleaning up.

. Incidental work.

. Protection and/or removal and reinstallation of signs, lampposts and mailboxes.

. Restoration and replacement of curbing.

. Protection and bracing of utility poles.

. Restoring easement and right-of-ways.

. Temporary facilities.

RODUCTS

ATERIALS

aterials required for this Section shall be the same quality of materials that are to be restored. Where possible, re-use existing materials that are removed.

XECUTION

ESTORING DRIVEWAYS AND SIDEWALKS

xisting public and private driveways disturbed by the construction shall be replaced. Paved rives shall be repaved to the limits and thicknesses existing prior to construction. Gravel rives shall be replaced and regraded in kind.

B. Existing public and private sidewalks disturbed by the construction shall be replace sidewalks of equal quality and dimension.

3.02 CLEANING UP

A. Remove all construction material, excess excavation, buildings, equipment and oth remaining on the job as a result of construction operations and restore the site of th neat and orderly condition.

3.03 INCIDENTAL WORK

A. Do all incidental work not otherwise specified, but obviously necessary to the prop completion of the work as shown on the Drawings and as specified herein.

3.04 REMOVAL AND REPLACEMENT OF SIGNS, LAMPPOSTS AND MAILBOXE

A. Existing signs, lampposts and mailboxes which may be damaged or removed durin of installing the new pipelines shall be reinstalled in a vertical position at the same from which they were removed. Replace damaged items with items of equal or bet than the damaged items. Provide a concrete anchor as necessary, to ensure a rigid a Exercise care in the reinstallation of all items to prevent damage to the newly insta pipelines.

3.05 RESTORATION AND REPLACEMENT OF CURBING

A. Existing concrete, bituminous, timber or granite curbing shall be protected. If nece curbing shall be removed and replaced after backfilling. Curbing which is damage construction shall be replaced with curbing of equal quality and dimension at the C expense. Granite curbing removed and reset shall conform to Section 580.64 of the Massachusetts DPW Specifications. Joints between sections shall be pointed as re resetting. Bituminous berms shall conform to Section 501 of the Mass DPW Speci

3.06 COOPERATION WITH OTHER CONTRACTORS AND CONNECTION TO WO OTHERS

A. At several locations, construction on other contracts may be carried on during the s as construction under this Contract. It will be necessary for the Contractor to plan and cooperate with the other Contractor insofar as connections required to each oth and to prevent any interference and delay for which he/she shall receive no other c than that agreed upon for this Item.

3.07 PROTECTION AND BRACING OF UTILITY POLES

A. Make all arrangements with the proper utility companies for bracing and protection poles that may be damaged or endangered by the operations. Work under this item include the related removal and reinstallation of guy wires, or support poles wheth the Drawings or not.

RESTORING EASEMENTS AND RIGHT-OF-WAYS

Be responsible for all damage to private property due to the operations. Protect from injury all walls, fences, cultivated shrubbery and vegetables, fruit trees, pavement, underground facilities, such as water pipe, or other utilities which may be encountered along the route. If removal and replacement are required, it shall be done in a workmanlike manner so that replacement is equivalent to that which existed prior to construction.

Existing lawn and sod surfaces damaged by construction shall be replaced. Cut and replace the awn and sod, or restore the areas with an equivalent depth and quality of loam, seed and ertilizer as necessary to produce a stand of grass at least equal to that existing prior to construction. These areas shall be maintained and reseeded, if necessary, until all work under his Contract has been completed and accepted. Any additional work required to restore property to the original condition shall be performed.

Existing trees, shrubs, plants and bushes outside of easements shall be fully protected as pecified in Section 01046. The work shall also include removing and replacing those trees, hrubs and bushes as indicated on the Drawings. It shall include the careful excavation of the oot ball which shall be wrapped with burlap while out of the ground. Replant them after backfilling the trench, stake them in an upright position and shall periodically water replanted rees, bushes and shrubs. Be fully responsible for ensuring that any and all trees, bushes and hrubs removed and replanted "take" and return to a viable state. Any replanted item that fails o "take" or that is so damaged as to be unsuitable for replanting shall be replaced, at no dditional cost to the Owner, with a tree, bush or shrub equal to the one removed.

The Engineer will inspect all work for provisional acceptance upon the written request received t least 10 days before the anticipated date of inspection.

After all necessary corrective work has been completed, the Engineer will certify in writing the provisional acceptance of the planting.

All plants shall be guaranteed for not less than 1 full year from the time of provisional cceptance.

At the end of this period, any plant that is missing, dead, or not in satisfactory growth, as determined by the Engineer, shall be replaced.

All replacements shall be plants of the same kind and size. They shall be furnished and planted as specified herein. The cost of replacement shall be borne by the Contractor except where it can be definitely shown that loss resulted from vandalism or the Owner's failure to maintain planting as instructed.

At the end of the guarantee period, inspection will be made by the Engineer upon written request submitted by the landscape contractor at least 10 days before the anticipated date.

After all necessary corrective work has been completed and tree staking has been removed, the Engineer will certify in writing the final acceptance of the planting.

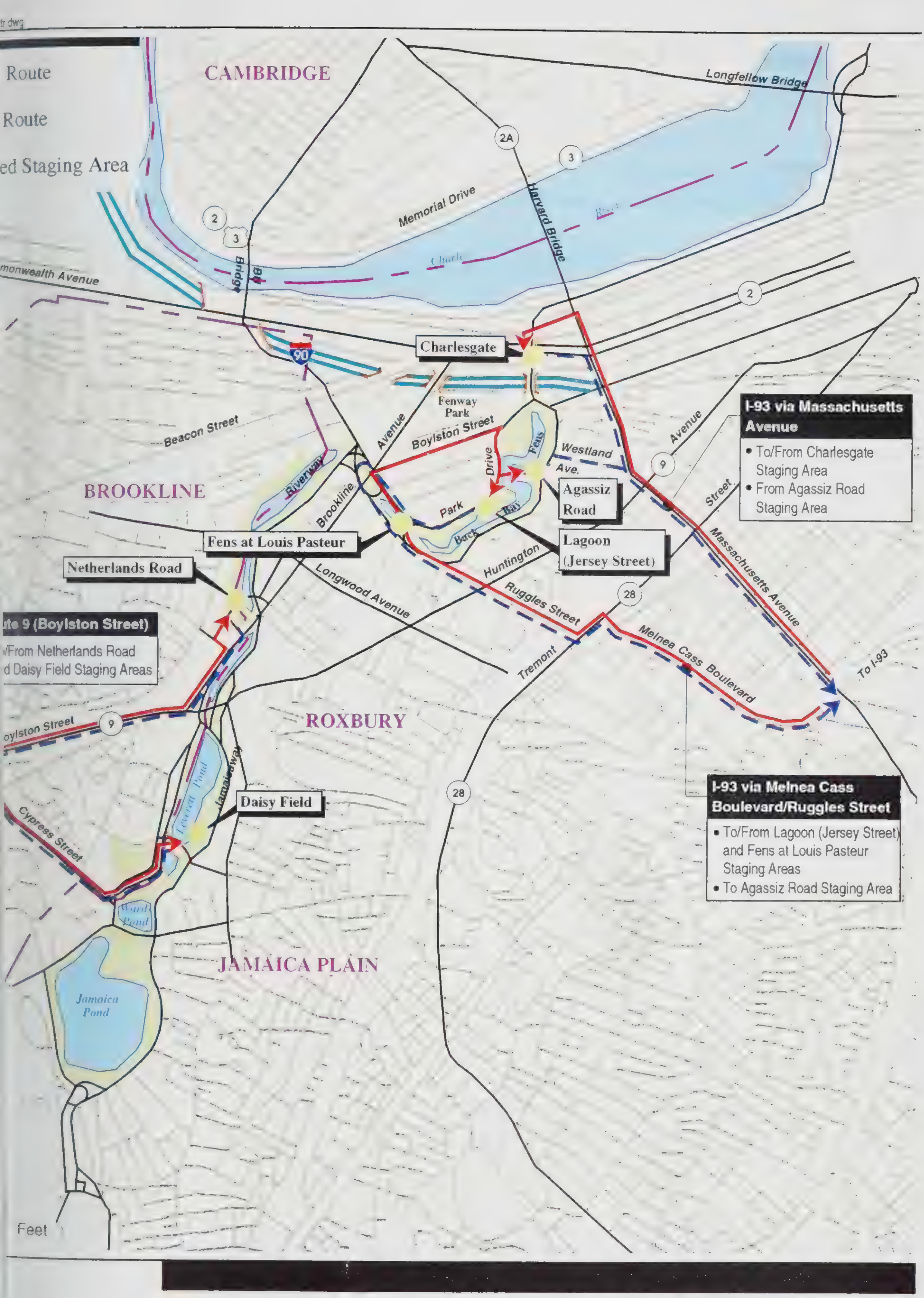
3.09 TEMPORARY FACILITIES

A. Furnish, install, maintain and remove all temporary facilities required for constructio
for in this Section.

END OF SECTION

Appendix A

Preliminary Design Plans



Muddy River Restoration
Proposed Regional Truck Haul Routes

Figure A-1

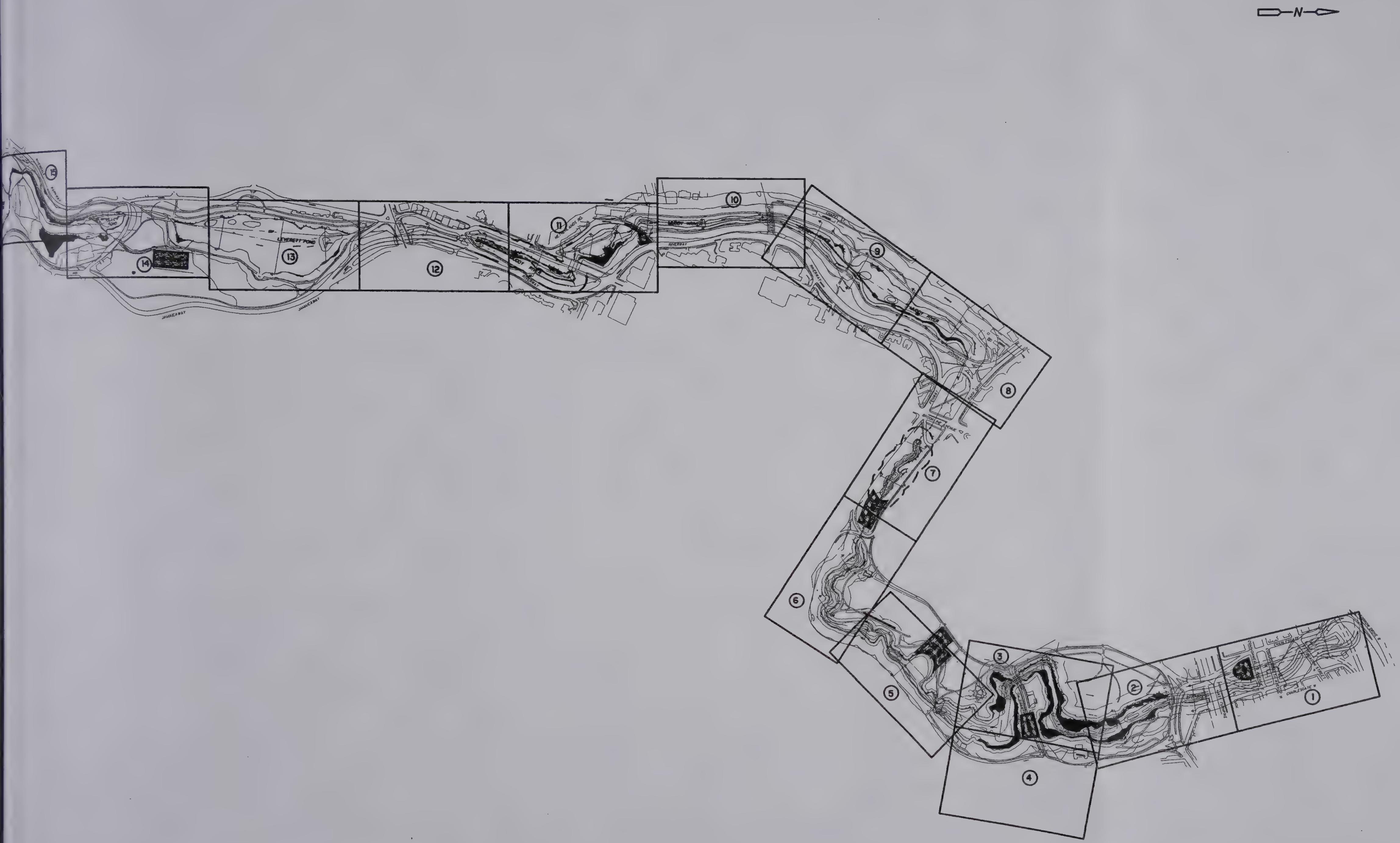
ex of Drawings

umber

Brookline Avenue
Riverway
Avenue Louis Pasteur
Former Sears Parking Lot
Upstream of Avenue Louis Pasteur
Typical Daylighting Cross Section

Plan View of Muddy River
Site Sections I
Site Sections II
Site Sections III

Proposed Modifications Under Face of Gatehouse
Overflow to Gate House
Proposed Overflow Connection to Culvert
Proposed 48" Water Main Culvert Crossing
Proposed 48" Water Main Culvert Crossing
Proposed 48" Water Main Culvert Crossing
Proposed Drain Connections
Landscape Design Drawings



DESIGNED BY: J. STEELE DRAWN BY: R. DEARDON SHEET CHK'D BY: CROSS CHK'D BY: APPROVED BY: DATE: APRIL 2001	**CDM** Camp Dresser & McKee Inc. consulting engineering construction operations	**MUDDY RIVER RESTORATION PROJECT**	**KEY PLAN**

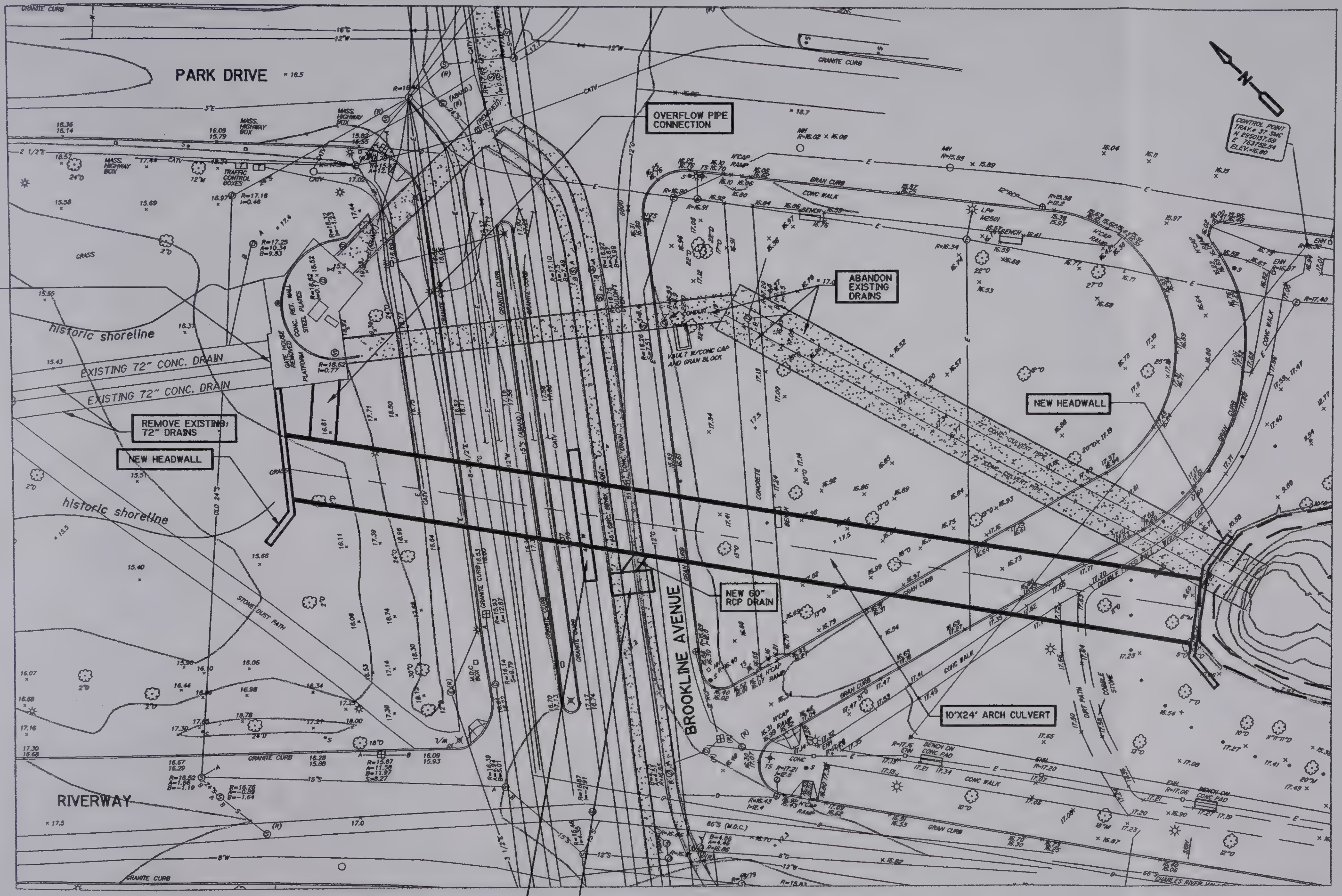
REMARKS

PROJECT NO.
FILE NAME:
SHEET NO.

TO THE LIMITS
THROUGH 2-23.

MENT FROM WITHIN
S OF THE STRUCTURES
ATIONS.

ENINGS
GATEHOUSE COVERED



RELOCATE EXISTING 48" WATER MAIN OVER NEW DRAIN

NEW PRECAST CONCRETE STRUCTURE TO CONNECT EXISTING 51"X51" CONC. DRAIN AND 45" BRICK DRAIN TO NEW CULVERT

1" = 20'
10 0 20

REMARKS

DESIGNED BY: J. NISHIMOTO
DRAWN BY: J. WHITLEY
SHEET CHK'D BY: B. BUCKLEY
CROSS CHK'D BY: B. BUCKLEY
APPROVED BY: B. CONKLIN
DATE: AUGUST 2000

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construction
operations

MUDDY RIVER RESTORATION PROJECT

BROOKLINE AVENUE

PROJECT NO. 1517-28449
FILE NAME: CSTPL333

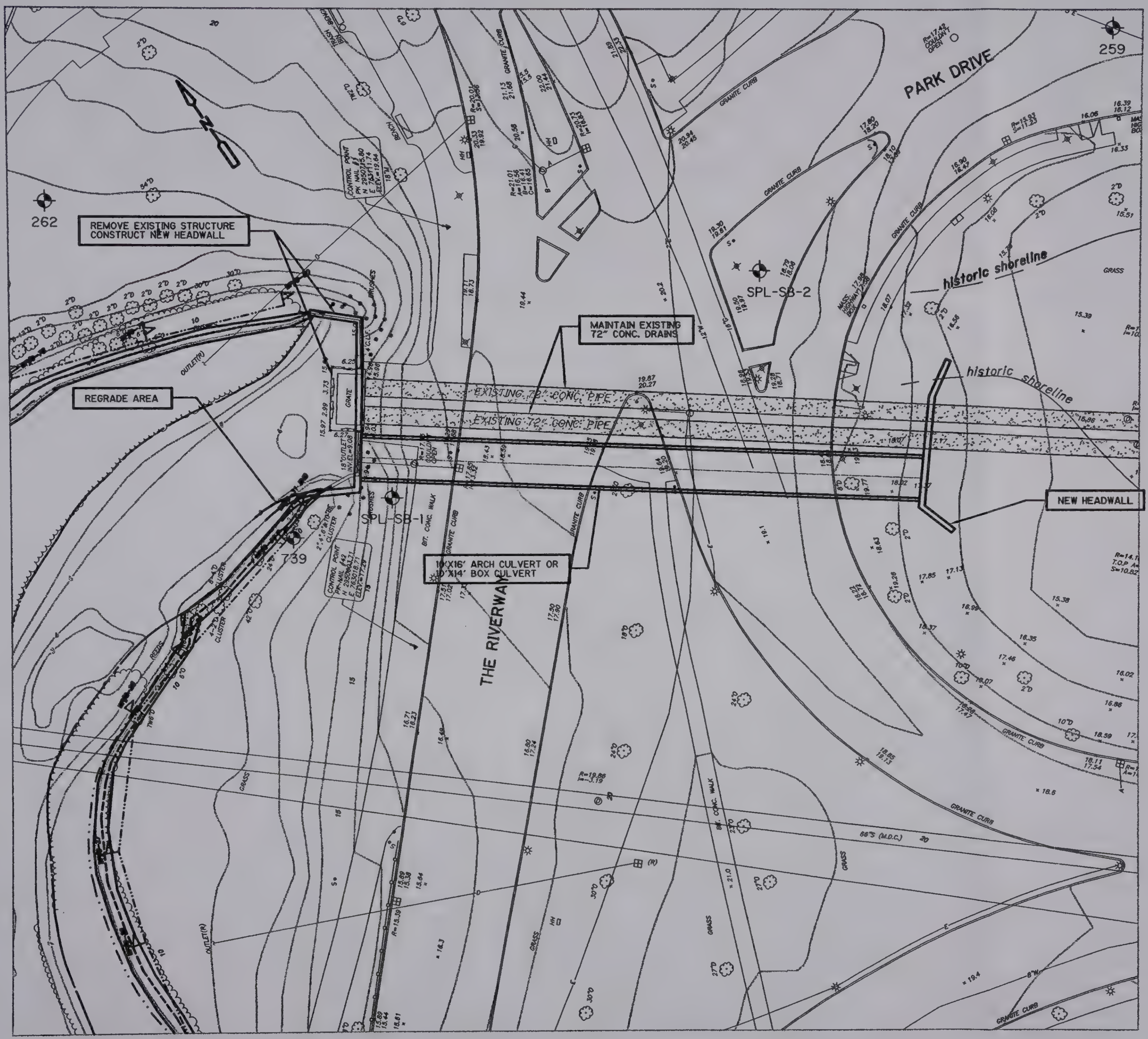
SHEET NO.
2-1

R:\1517\28449\CIVIL\CSTPL333

NOTES

RIVER CHANNEL TO THE LIMITS
ON FIGURES 2-21 THROUGH 2-23.

DEPOSITED SEDIMENT FROM WITHIN
RTS TO THE LIMITS OF THE STRUCTURES
OR ORIGINAL ELEVATIONS.



1" = 20'
10 0 20

REMARKS

DESIGNED BY: J. NISHIMOTO
DRAWN BY: J. WHITLEY
SHEET CHK'D BY: B. BUCKLEY
CROSS CHK'D BY: B. BUCKLEY
APPROVED BY: B. CONKLIN
DATE: AUGUST 2000

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MUDDY RIVER RESTORATION PROJECT

RIVERWAY

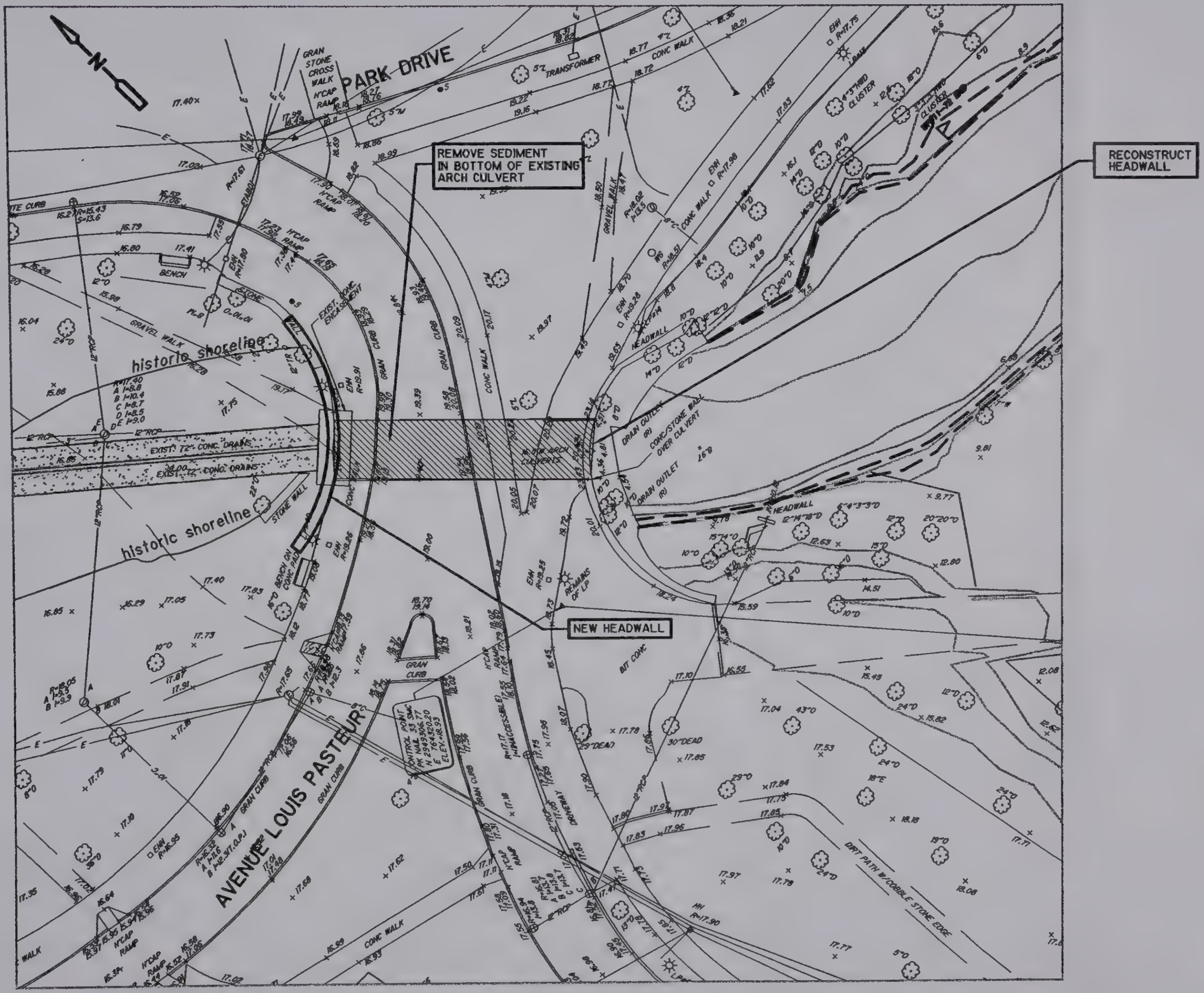
PROJECT NO. 1517-28449
FILE NAME: CSTPL331

SHEET NO.
2-2

R:\1517\28449\CIVIL\CSTPL331

NOTES

1. DREDGE RIVER CHANNEL TO THE LIMITS SHOWN ON FIGURES 2-21 THROUGH 2-23.
2. REMOVE DEPOSITED SEDIMENT FROM WITHIN CULVERTS TO THE LIMITS OF THE STRUCTURES AND/OR ORIGINAL ELEVATIONS.



REMOVE SEDIMENT IN BOTTOM OF EXISTING ARCH CULVERT

RECONSTRUCT HEADWALL

NEW HEADWALL

1" = 20'
10 0 20

REMARKS

DESIGNED BY: J. NISHIMOTO
DRAWN BY: J. WHITLEY
SHEET CHK'D BY: B. BUCKLEY
CROSS CHK'D BY: B. BUCKLEY
APPROVED BY: B. CONKLIN
DATE: AUGUST 2000

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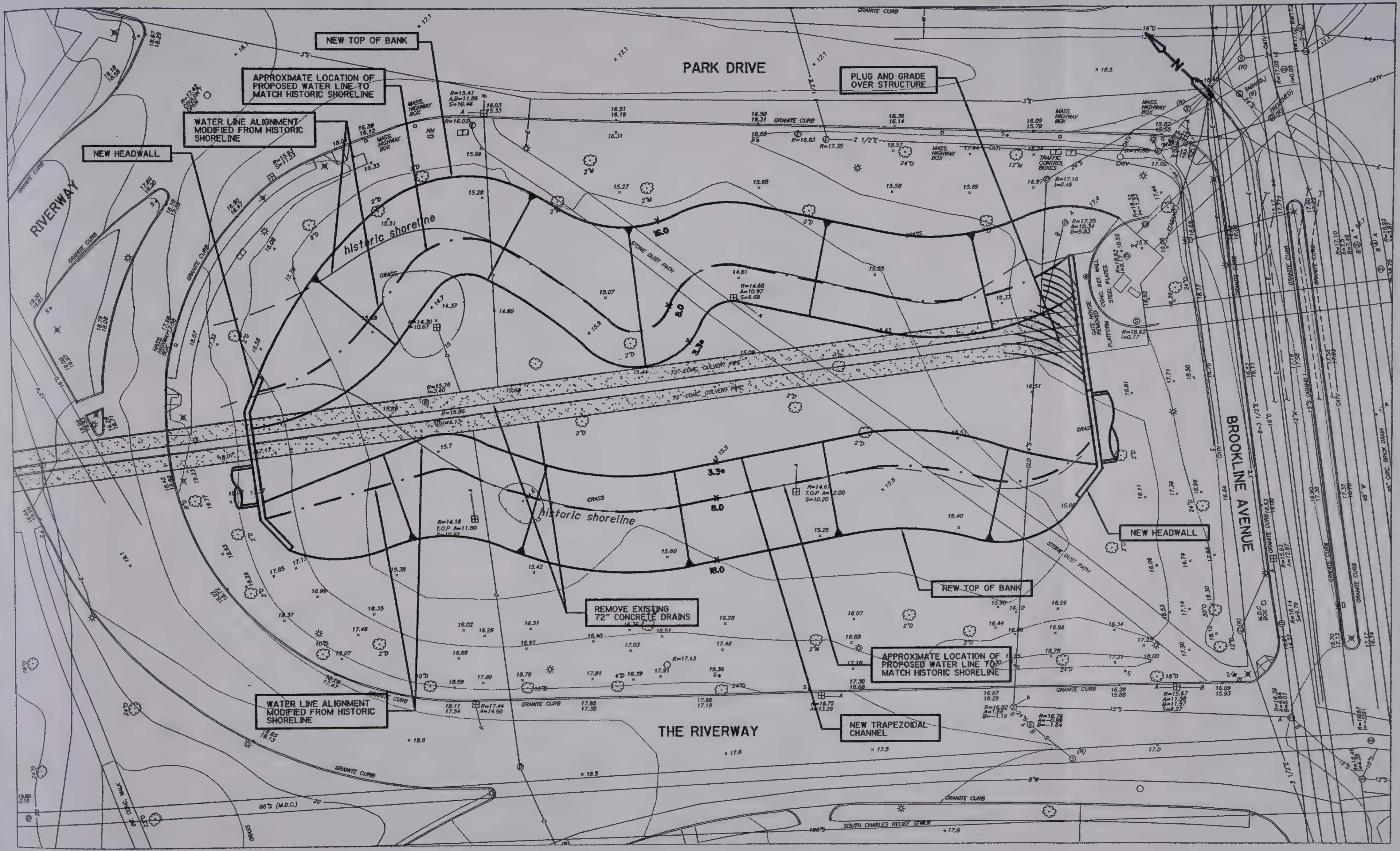
MUDDY RIVER RESTORATION PROJECT

AVENUE LOUIS PASTEUR

PROJECT NO. 1517-28449
FILE NAME: CSTPL335

SHEET NO.
2-3

R:\1517\28449\CIVIL\CSTPL335


PARK DRIVE
BROOKLINE AVENUE
THE RIVERWAY
RIVERWAY
NEW TOP OF BANK
APPROXIMATE LOCATION OF PROPOSED WATER LINE TO MATCH HISTORIC SHORELINE
WATER LINE ALIGNMENT MODIFIED FROM HISTORIC SHORELINE
NEW HEADWALL
PLUG AND GRADE OVER STRUCTURE
historic shoreline
72" CONC. CULVERT PIPE
STONE DUST PATH
GATE HOUSE REMOVED
CONC. RET. WALL STEEL PLATES PLATFORM
REMOVE EXISTING 72" CONCRETE DRAINS
NEW TRAPEZOIDAL CHANNEL
16.0
8.0
3.3*
GRANITE CURB
SOUTH CHARLES RELIEF SEWER
N

*CHANNEL BOTTOM ELEVATION AND LOCATION ARE APPROXIMATE AND DEPENDENT ON PROPOSED DREDGING DEPTH UPSTREAM AND DOWNSTREAM.

1" = 20'
10 0 20

DESIGNED BY:	J. NISHIMOTO
DRAWN BY:	G. BELIZAIRE
SHEET CHK'D BY:	B. BUCKLEY
CROSS CHK'D BY:	B. BUCKLEY
APPROVED BY:	B. CONKLIN
DATE:	AUGUST 2000

REMARKS

CDM Camp Dresser & McKee Inc.
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MUDDY RIVER RESTORATION PROJECT

FORMER SEARS PARKING LOT

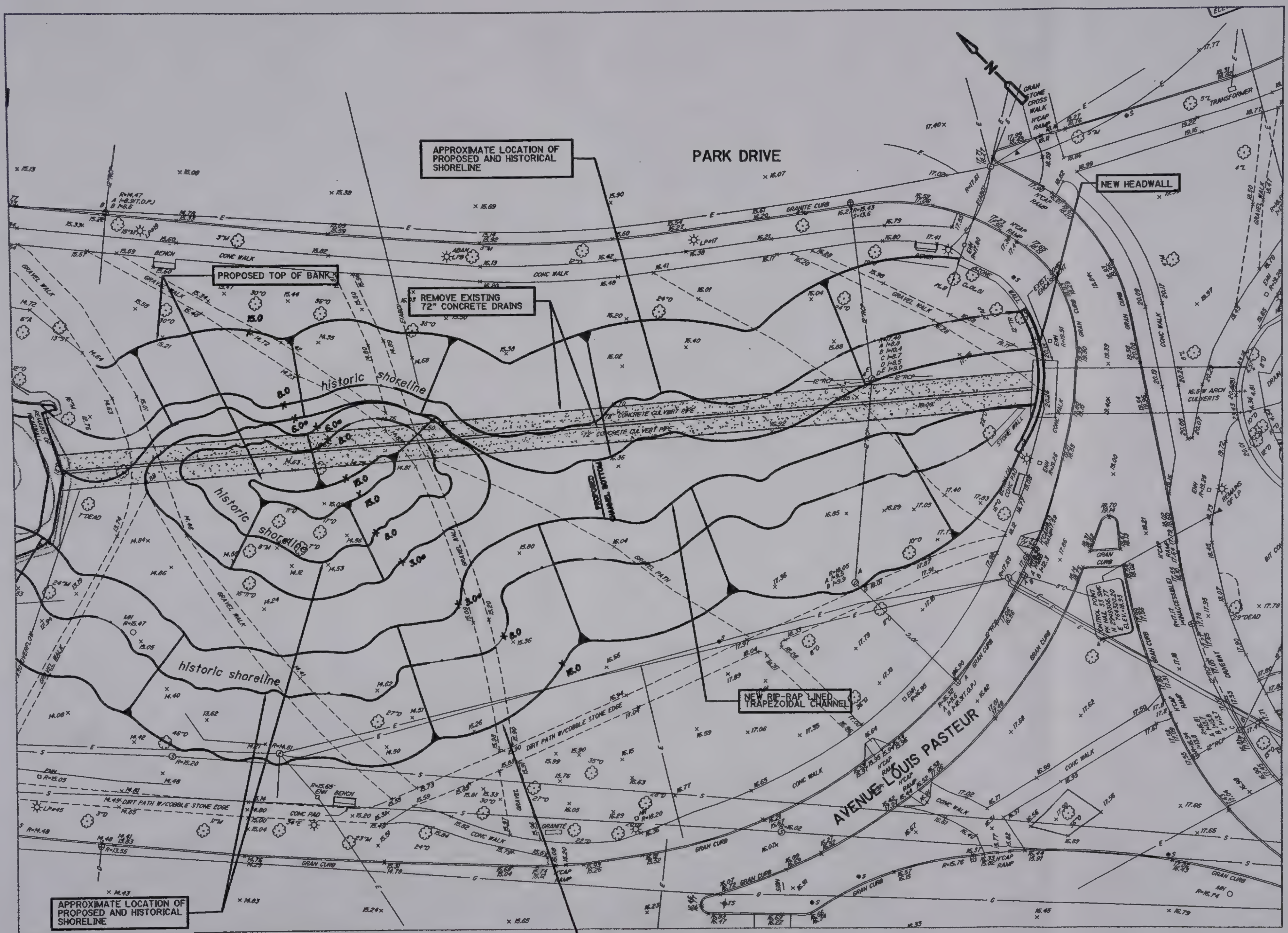
PROJECT NO. 1517-28449
FILE NAME: CSTPL332

SHEET NO.
2-4

R:\1517\28449\CIVL\CSTPL332

NNEL TO THE LIMITS
S 2-21 THROUGH 2-23.

D SEDIMENT FROM WITHIN
LIMITS OF THE STRUCTURES
ELEVATIONS.



*CHANNEL BOTTOM ELEVATION AND LOCATION IS APPROXIMATE AND DEPENDENT ON PROPOSED DREDGING DEPTHS UPSTREAM AND DOWNSTREAM.

1" = 20'
10 0 20

REMARKS

DESIGNED BY: J. NISHIMOTO
DRAWN BY: G. BELIZAIRE
SHEET CHK'D BY: B. BUCKLEY
CROSS CHK'D BY: B. BUCKLEY
APPROVED BY: B. CONKLIN
DATE: AUGUST 2000

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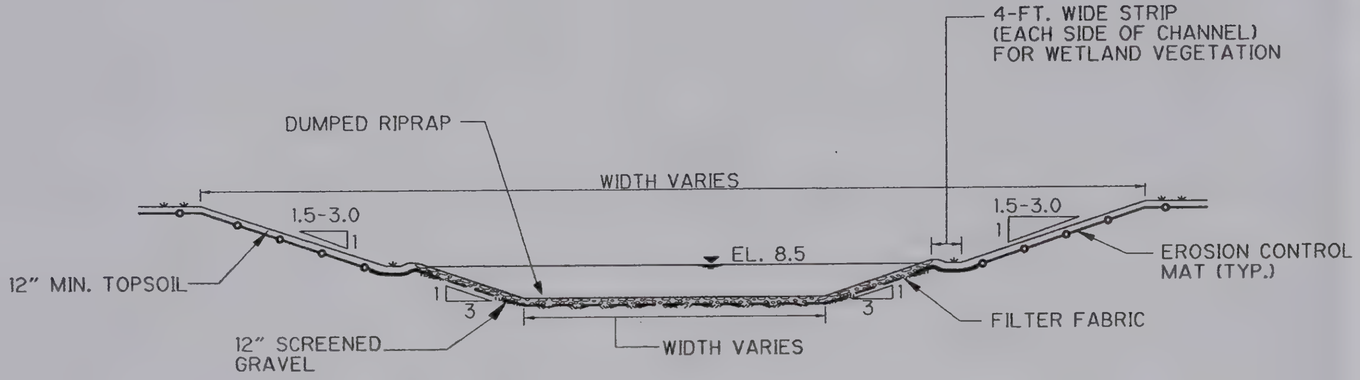
MUDDY RIVER RESTORATION PROJECT

UPSTREAM OF AVENUE LOUIS PASTEUR

PROJECT NO. 1517-28449
FILE NAME: CSTPL334

SHEET NO.
2-5

R:\1517\28449\CIVIL\CSTPL334



10 0 20

SCALE: HOR. 1"=20'
VERT. 1"=20'

DATE	DRWN	CHKD	REMARKS

DESIGNED BY:
DRAWN BY:
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: APRIL 2001

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MUDDY RIVER RESTORATION PROJECT

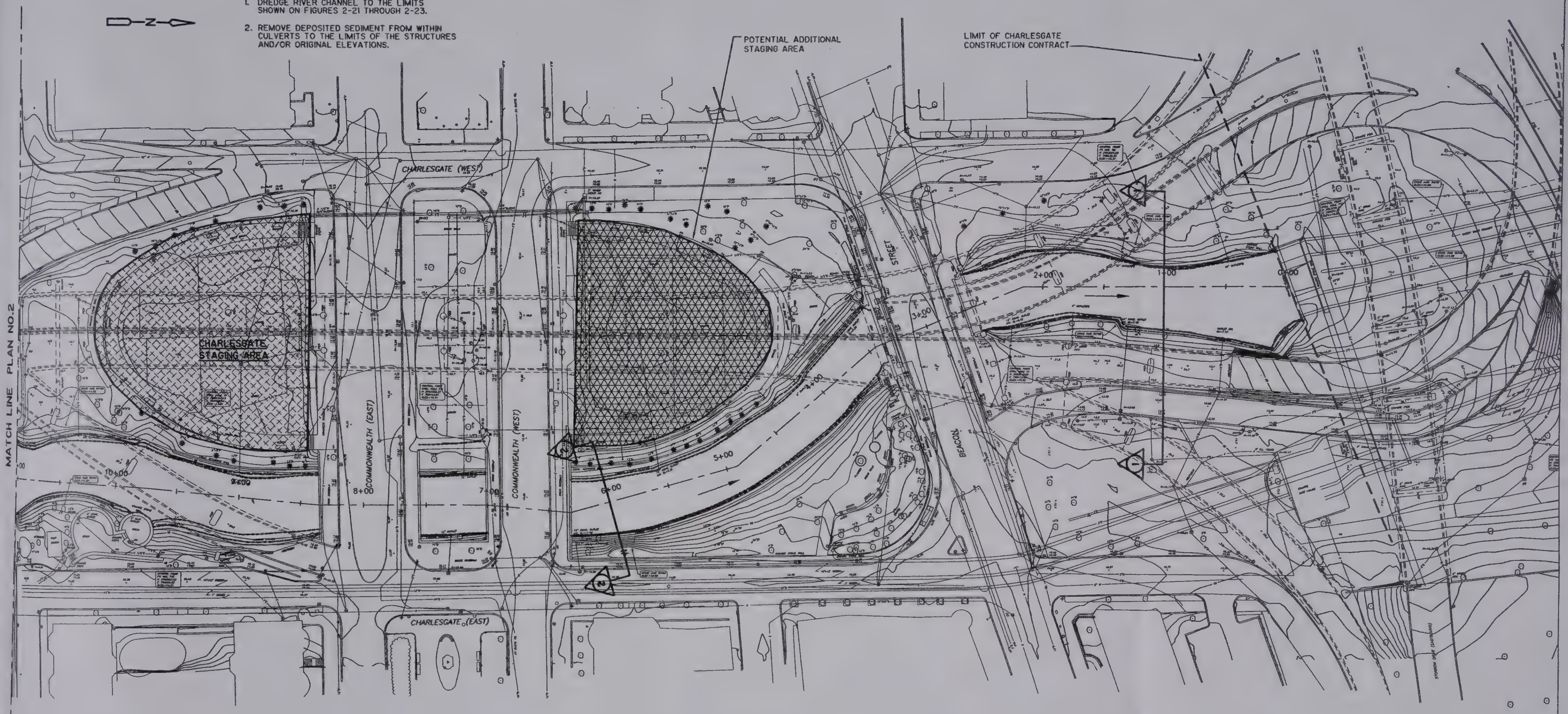
TYPICAL DAYLIGHTING
CROSS SECTION

PROJECT NO.
FILE NAME:

SHEET NO.
2-6

NOTES

1. DREDGE RIVER CHANNEL TO THE LIMITS SHOWN ON FIGURES 2-21 THROUGH 2-23.
2. REMOVE DEPOSITED SEDIMENT FROM WITHIN CULVERTS TO THE LIMITS OF THE STRUCTURES AND/OR ORIGINAL ELEVATIONS.



1" = 40'
20 0 40

DESIGNED BY:	J. STEELE
DRAWN BY:	R. DEARDON
SHEET CHK'D BY:	
CROSS CHK'D BY:	
APPROVED BY:	
DATE:	APRIL 2001

REMARKS

DATE DRWN CHKD

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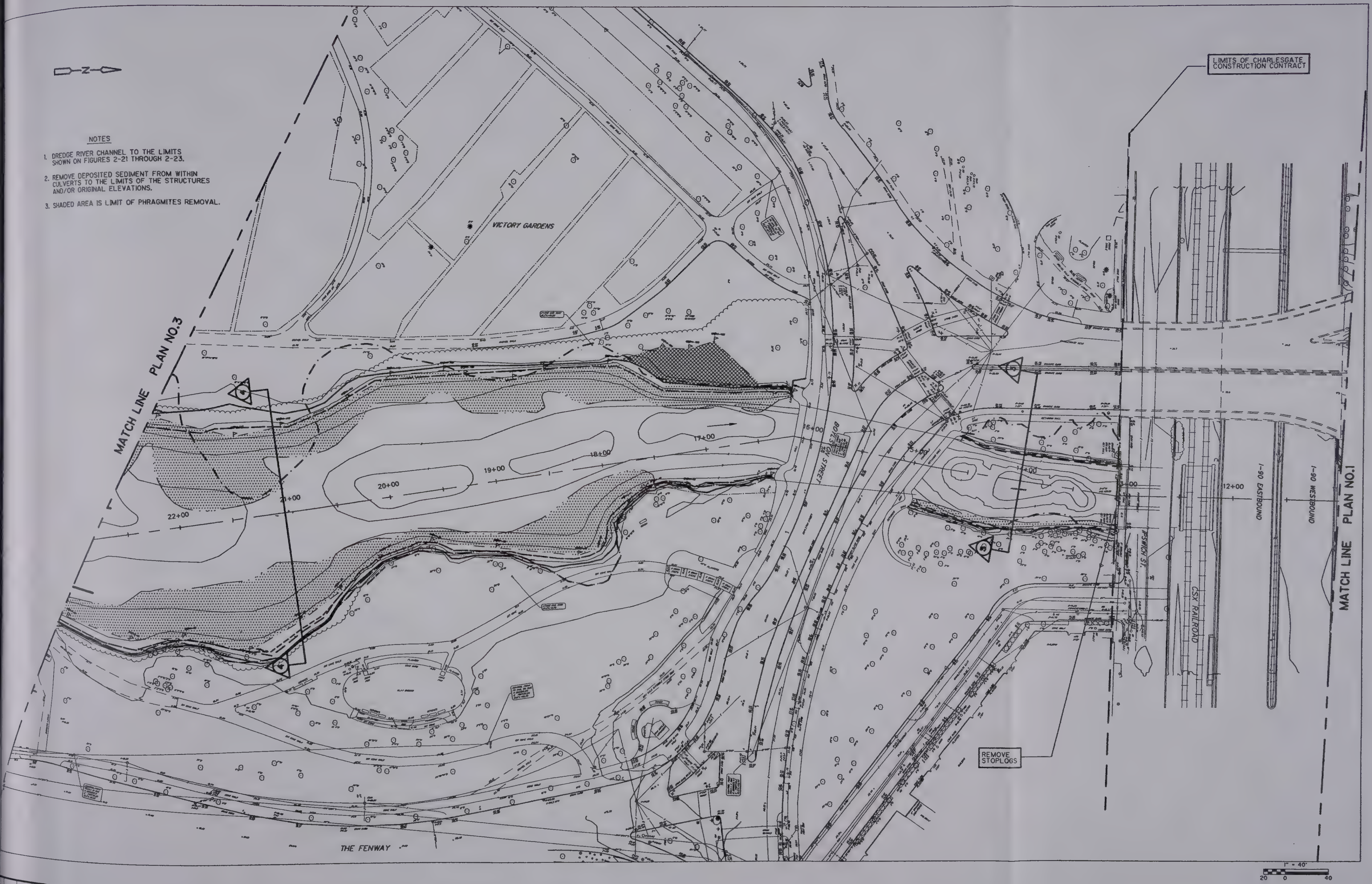
MUDDY RIVER RESTORATION PROJECT

PLAN NO. 1

PROJECT NO.
FILE NAME:

SHEET NO.
2-7

R:\1517\28449\CIVIL\CSTPL201



NOTES

1. DREDGE RIVER CHANNEL TO THE LIMITS SHOWN ON FIGURES 2-21 THROUGH 2-23.
2. REMOVE DEPOSITED SEDIMENT FROM WITHIN CULVERTS TO THE LIMITS OF THE STRUCTURES AND/OR ORIGINAL ELEVATIONS.
3. SHADED AREA IS LIMIT OF PHRAGMITES REMOVAL.

DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. STEELE
DRAWN BY: R. DEARDON
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: APRIL 2001

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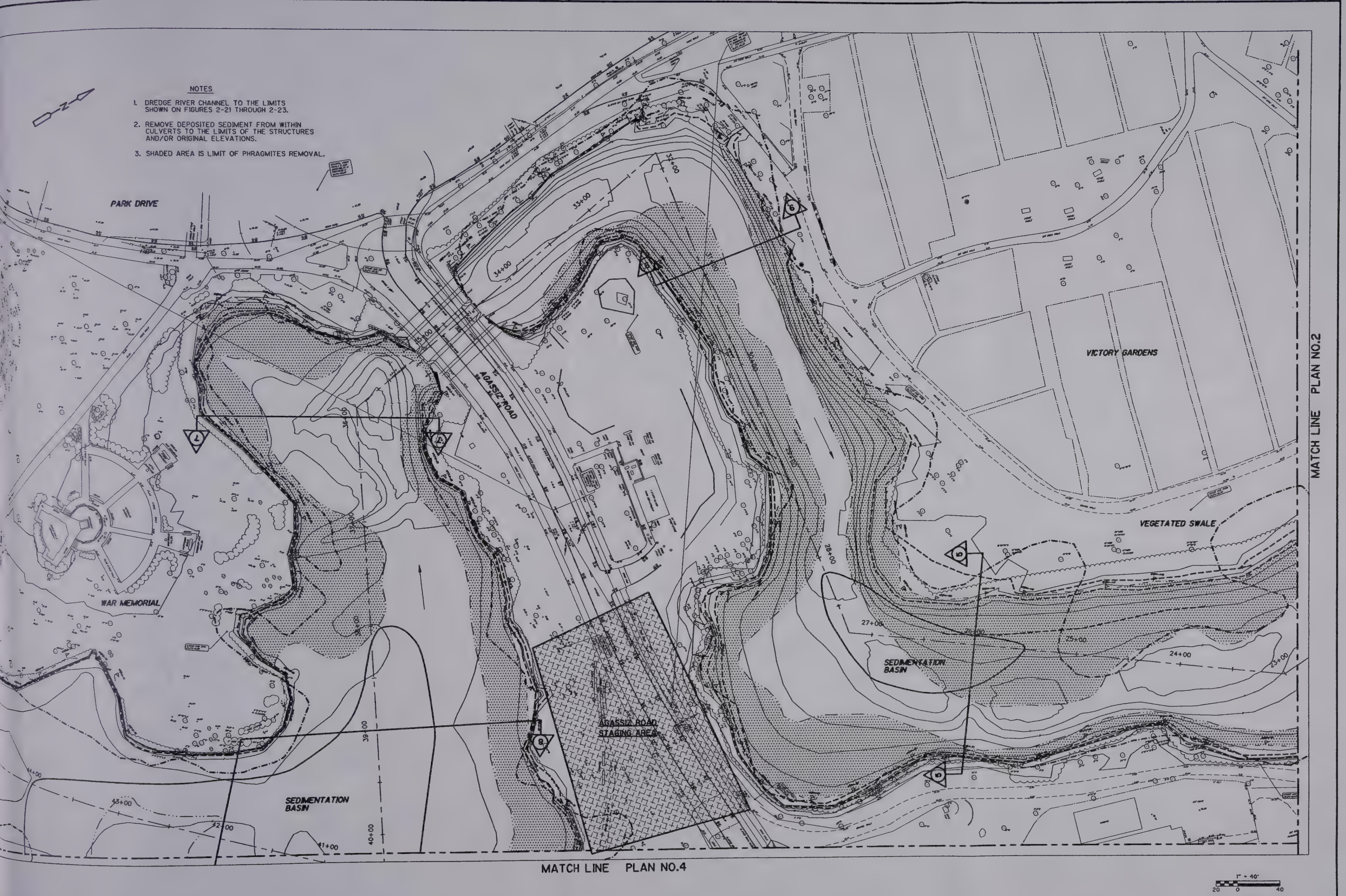
MUDDY RIVER RESTORATION PROJECT

PLAN NO. 2

PROJECT NO.
FILE NAME:

SHEET NO.
2-8

R:\1517\28449\CIVL\CSTPL202



NOTES

1. DREDGE RIVER CHANNEL TO THE LIMITS SHOWN ON FIGURES 2-21 THROUGH 2-23.
2. REMOVE DEPOSITED SEDIMENT FROM WITHIN CULVERTS TO THE LIMITS OF THE STRUCTURES AND/OR ORIGINAL ELEVATIONS.
3. SHADED AREA IS LIMIT OF PHRAGMITES REMOVAL.

DSN	CHKD	REMARKS

DESIGNED BY: J. STEELE
DRAWN BY: R. DEARDON
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: APRIL 2001

CDM Camp Dresser & McKee Inc.

MUDDY RIVER RESTORATION PROJECT

PLAN NO. 3

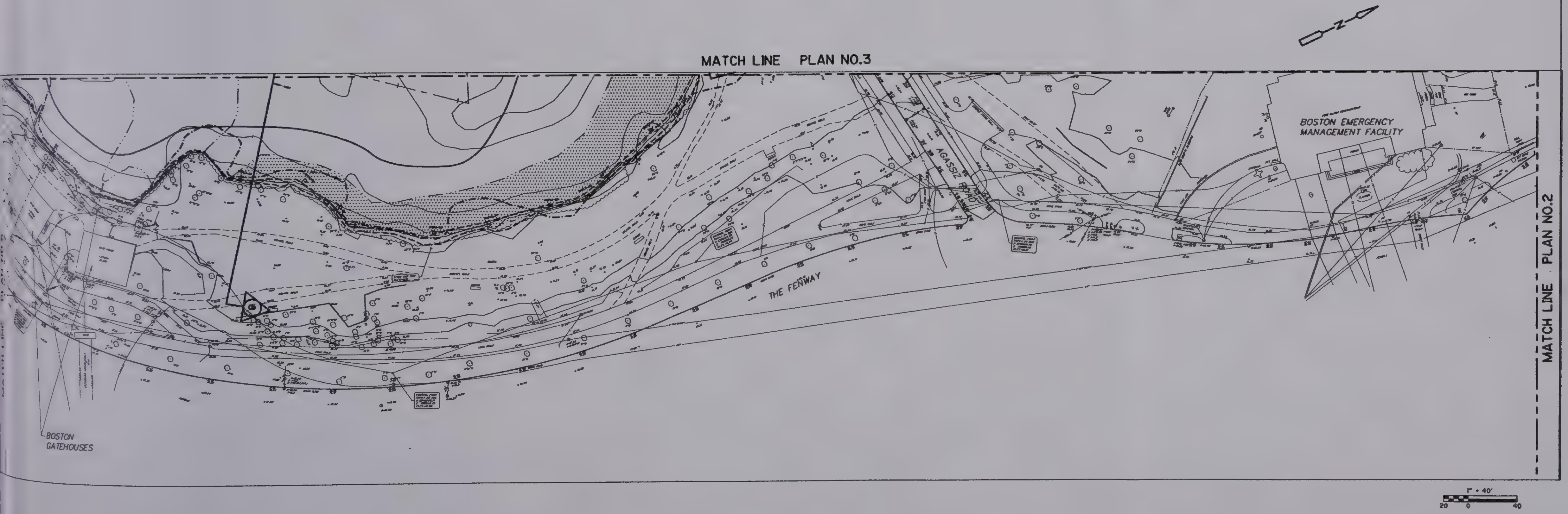
PROJECT NO.
FILE NAME:

SHEET NO.
2-9

R:\1517\28449\CIVL\CSTPL203

NOTES

1. DREDGE RIVER CHANNEL TO THE LIMITS SHOWN ON FIGURES 2-21 THROUGH 2-23.
2. REMOVE DEPOSITED SEDIMENT FROM WITHIN CULVERTS TO THE LIMITS OF THE STRUCTURES AND/OR ORIGINAL ELEVATIONS.
3. SHADED AREA IS LIMIT OF PHRAGMITES REMOVAL.



DESIGNED BY:	J. STEELE
DRAWN BY:	R. DEARDON
SHEET CHK'D BY:	
CROSS CHK'D BY:	
APPROVED BY:	
DATE:	APRIL 2001

REMARKS

CHKD

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MUDDY RIVER RESTORATION PROJECT

PLAN NO. 4

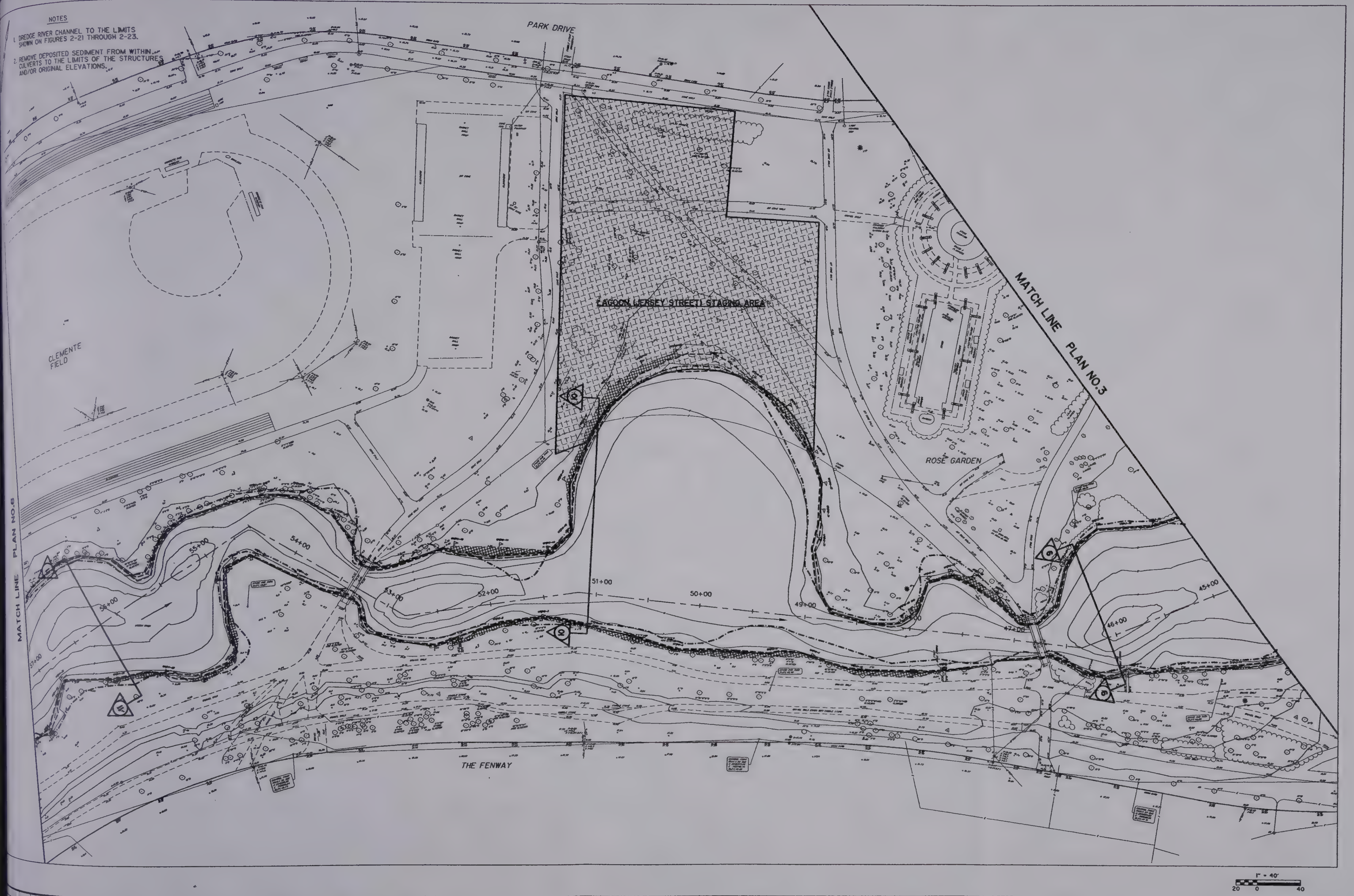
PROJECT NO.
FILE NAME:

SHEET NO.
2-10

R:\1517\28449\CIVL\CSTPL204

NOTES

1. DREDGE RIVER CHANNEL TO THE LIMITS SHOWN ON FIGURES 2-21 THROUGH 2-23.
2. REMOVE DEPOSITED SEDIMENT FROM WITHIN CULVERTS TO THE LIMITS OF THE STRUCTURES AND/OR ORIGINAL ELEVATIONS.



DESIGNED BY:	J. STEELE
DRAWN BY:	R. DEARDON
SHEET CHK'D BY:	
CROSS CHK'D BY:	
APPROVED BY:	
DATE:	APRIL 2001

REMARKS

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MUDDY RIVER RESTORATION PROJECT

PLAN NO. 5

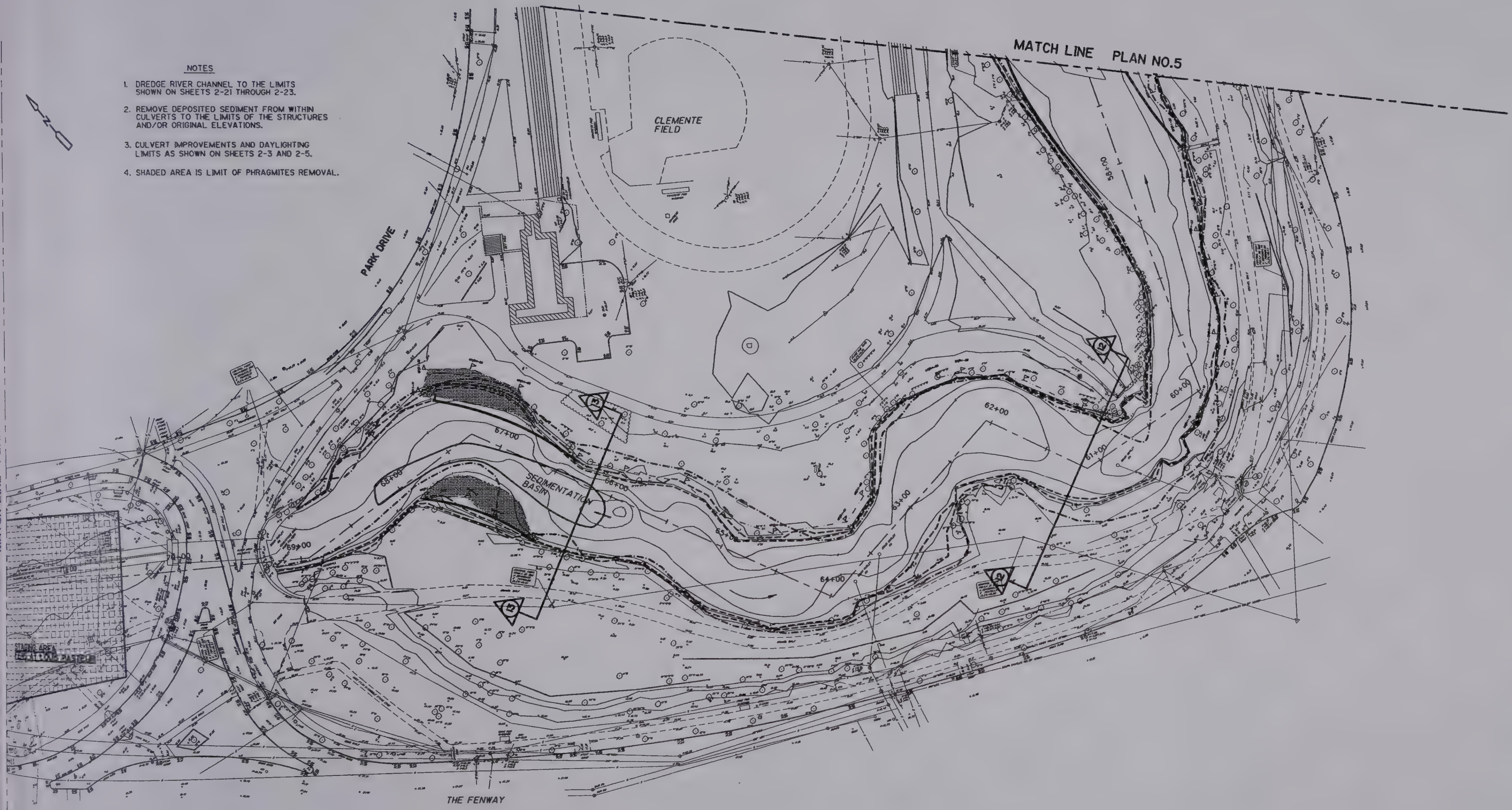
PROJECT NO.
FILE NAME:

SHEET NO.
2-11

R:\1517\28449\CIVL\CSTPL205

NOTES

1. DREDGE RIVER CHANNEL TO THE LIMITS SHOWN ON SHEETS 2-21 THROUGH 2-23.
2. REMOVE DEPOSITED SEDIMENT FROM WITHIN CULVERTS TO THE LIMITS OF THE STRUCTURES AND/OR ORIGINAL ELEVATIONS.
3. CULVERT IMPROVEMENTS AND DAYLIGHTING LIMITS AS SHOWN ON SHEETS 2-3 AND 2-5.
4. SHADED AREA IS LIMIT OF PHRAGMITES REMOVAL.



1" = 40'
20 0 40

DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. STEELE
DRAWN BY: R. DEARDON
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: APRIL 2001

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MUDDY RIVER RESTORATION PROJECT

PLAN NO. 6

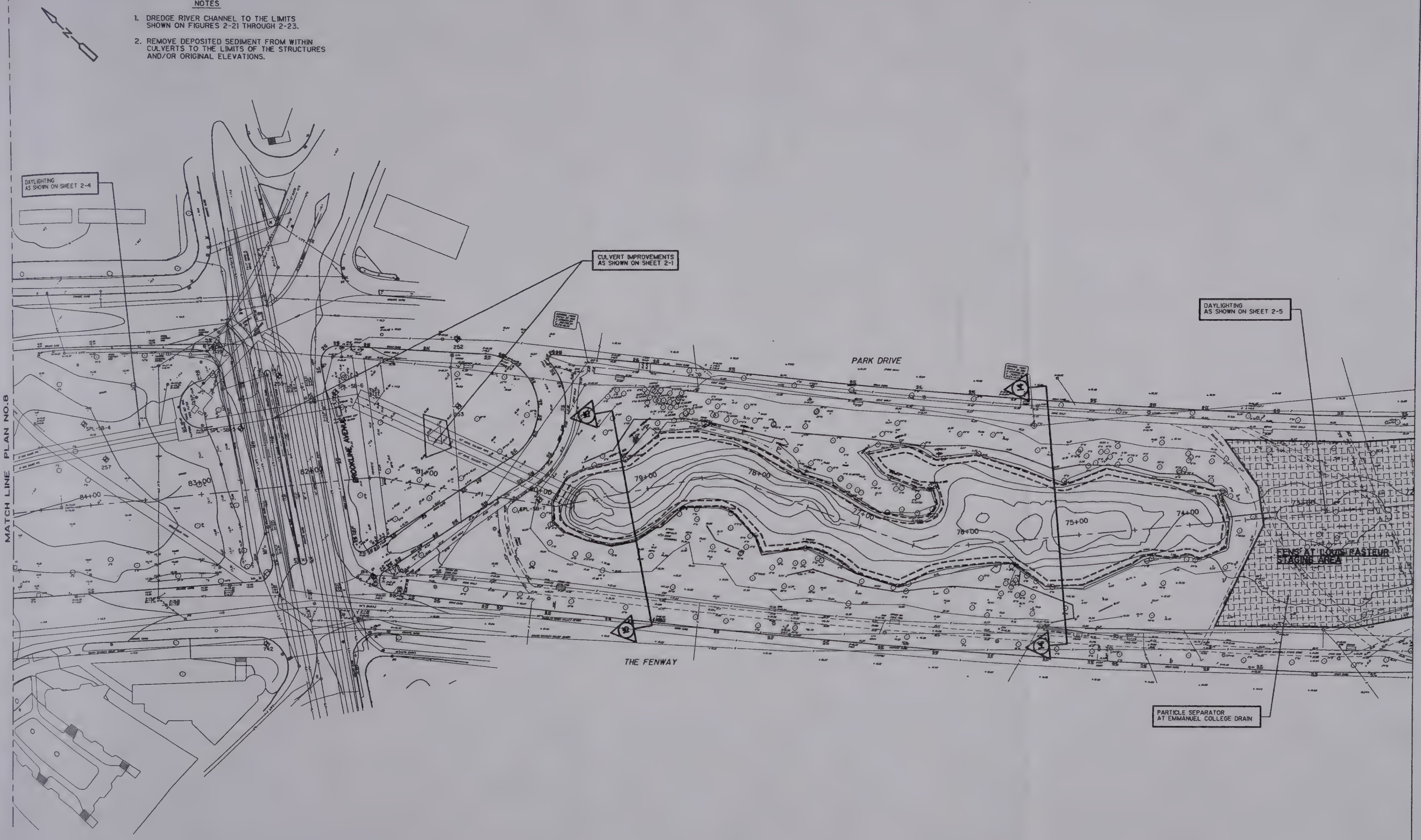
PROJECT NO.
FILE NAME:

SHEET NO.
2-12

R:\1517\28449\CIVL\CSTPL206

NOTES

1. DREDGE RIVER CHANNEL TO THE LIMITS SHOWN ON FIGURES 2-21 THROUGH 2-23.
2. REMOVE DEPOSITED SEDIMENT FROM WITHIN CULVERTS TO THE LIMITS OF THE STRUCTURES AND/OR ORIGINAL ELEVATIONS.


N
MATCH LINE PLAN NO.8
DAYLIGHTING AS SHOWN ON SHEET 2-4
CULVERT IMPROVEMENTS AS SHOWN ON SHEET 2-1
DAYLIGHTING AS SHOWN ON SHEET 2-5
PARK DRIVE
BROOKLINE AVENUE
THE FENWAY
SPL-SB-4
SPL-SB-5
SPL-SB-6
SPL-SB-7
257
252
253
255
742
84+00
83+00
82+00
81+00
80+00
79+00
78+00
77+00
76+00
75+00
74+00
73+00
FENS AT LOUIS PASTEUR STAGING AREA
PARTICLE SEPARATOR AT EMMANUEL COLLEGE DRAIN

1" = 40'
20 0 40

REMARKS

DESIGNED BY: J. STEELE
DRAWN BY: R. DEARDON
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: APRIL 2001

CDM Camp Dresser & McKee Inc.

MUDDY RIVER RESTORATION PROJECT

PLAN NO. 7

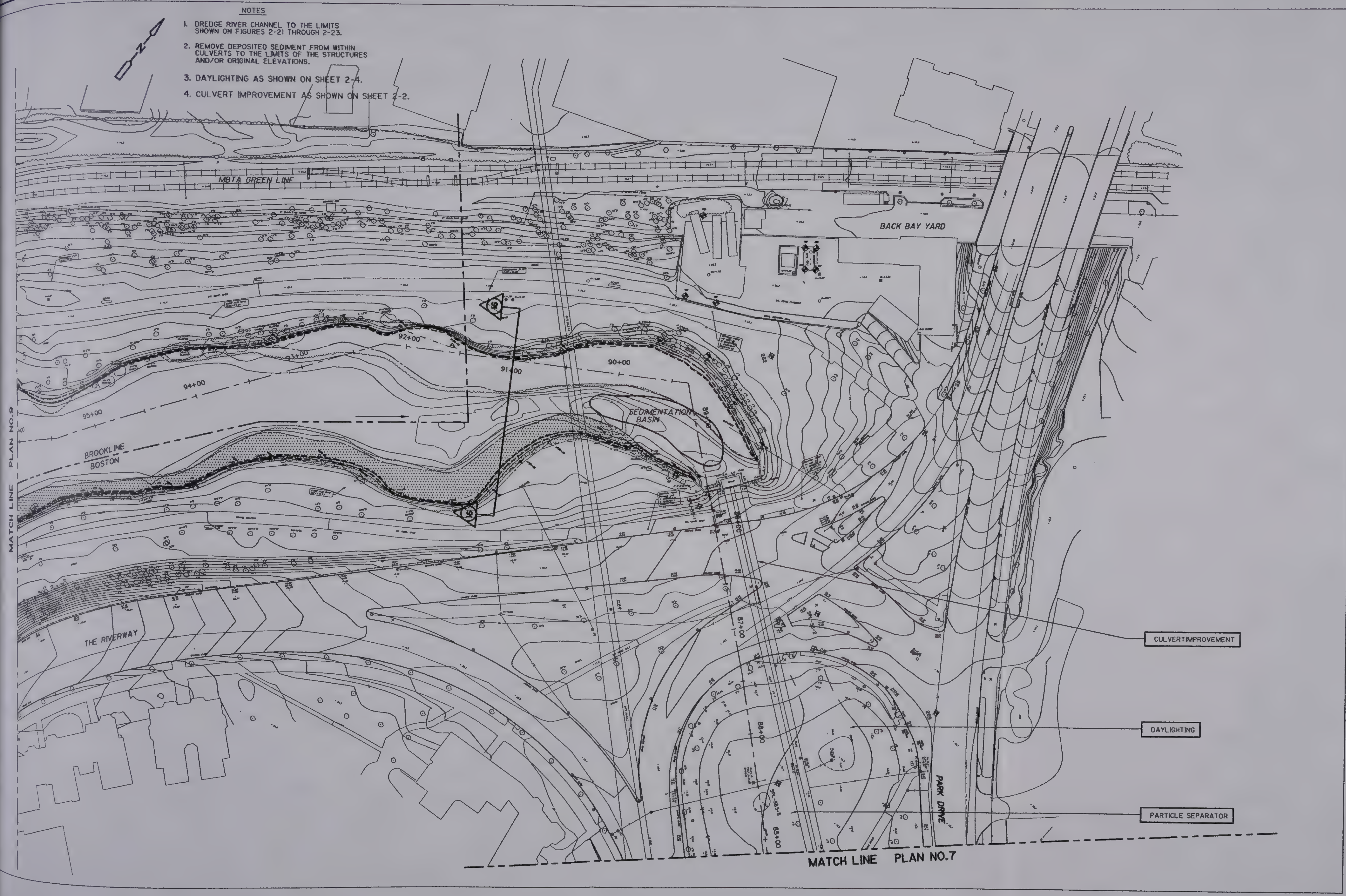
PROJECT NO.
FILE NAME:

SHEET NO.
2-13

R:\1517\28449\CIVL\CSTPL207

NOTES

1. DREDGE RIVER CHANNEL TO THE LIMITS SHOWN ON FIGURES 2-21 THROUGH 2-23.
2. REMOVE DEPOSITED SEDIMENT FROM WITHIN CULVERTS TO THE LIMITS OF THE STRUCTURES AND/OR ORIGINAL ELEVATIONS.
3. DAYLIGHTING AS SHOWN ON SHEET 2-4.
4. CULVERT IMPROVEMENT AS SHOWN ON SHEET 2-2.



DESIGNED BY:	J. STEELE
DRAWN BY:	R. DEARDON
SHEET CHK'D BY:	
CROSS CHK'D BY:	
APPROVED BY:	
DATE:	APRIL 2001

REMARKS

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MUDDY RIVER RESTORATION PROJECT

PLAN NO. 8

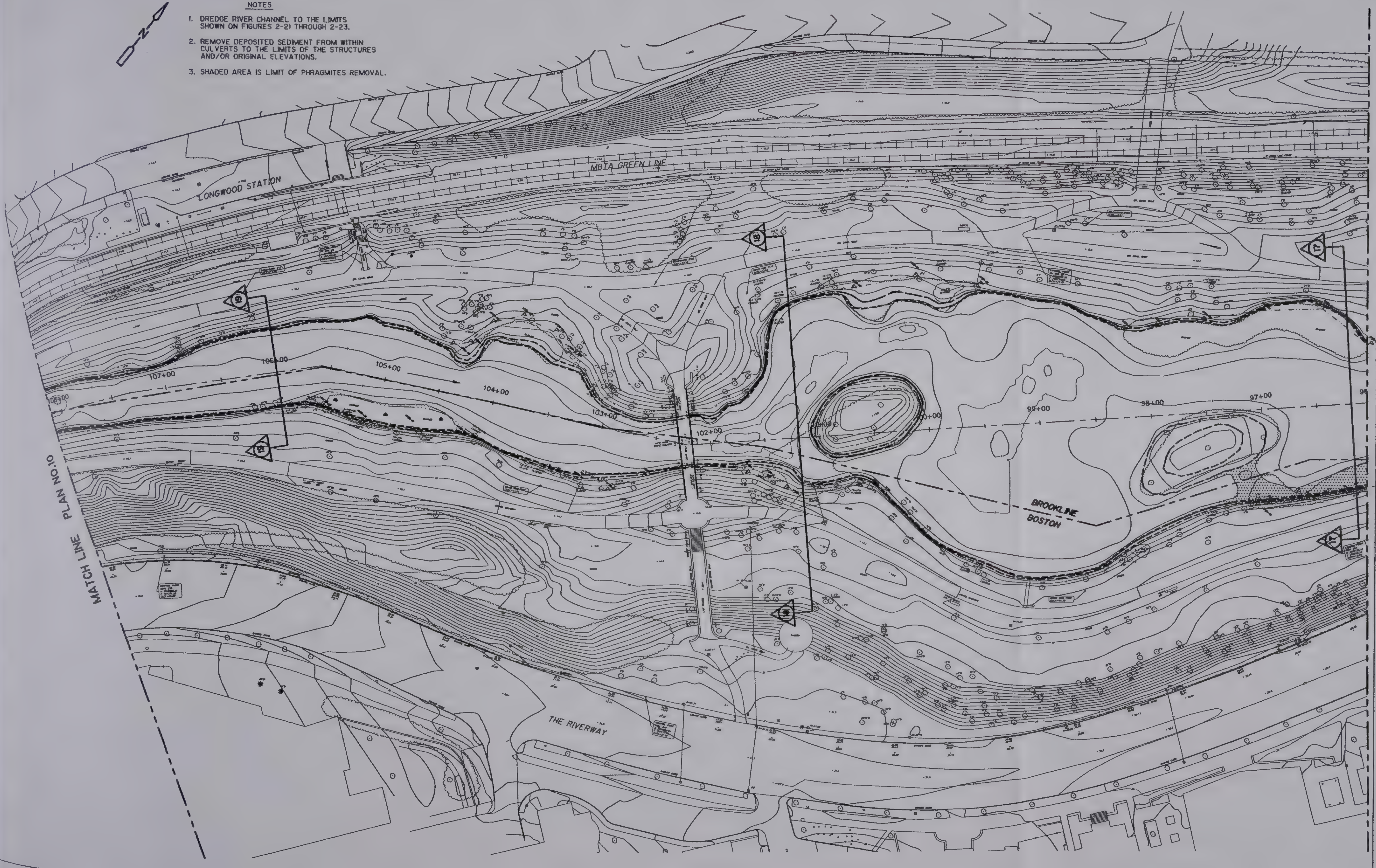
PROJECT NO.
FILE NAME:

SHEET NO.
2-14

R:\1517\28449\CIVL\CSTPL208

NOTES

1. DREDGE RIVER CHANNEL TO THE LIMITS SHOWN ON FIGURES 2-21 THROUGH 2-23.
2. REMOVE DEPOSITED SEDIMENT FROM WITHIN CULVERTS TO THE LIMITS OF THE STRUCTURES AND/OR ORIGINAL ELEVATIONS.
3. SHADED AREA IS LIMIT OF PHRAGMITES REMOVAL.



DESIGNED BY:	J. STEELE
DRAWN BY:	R. DEARDON
SHEET CHK'D BY:	
CROSS CHK'D BY:	
APPROVED BY:	
DATE:	APRIL 2001

REMARKS

CDM Camp Dresser & McKee Inc.

consulting engineering construction operations

MUDDY RIVER RESTORATION PROJECT

PLAN NO. 9

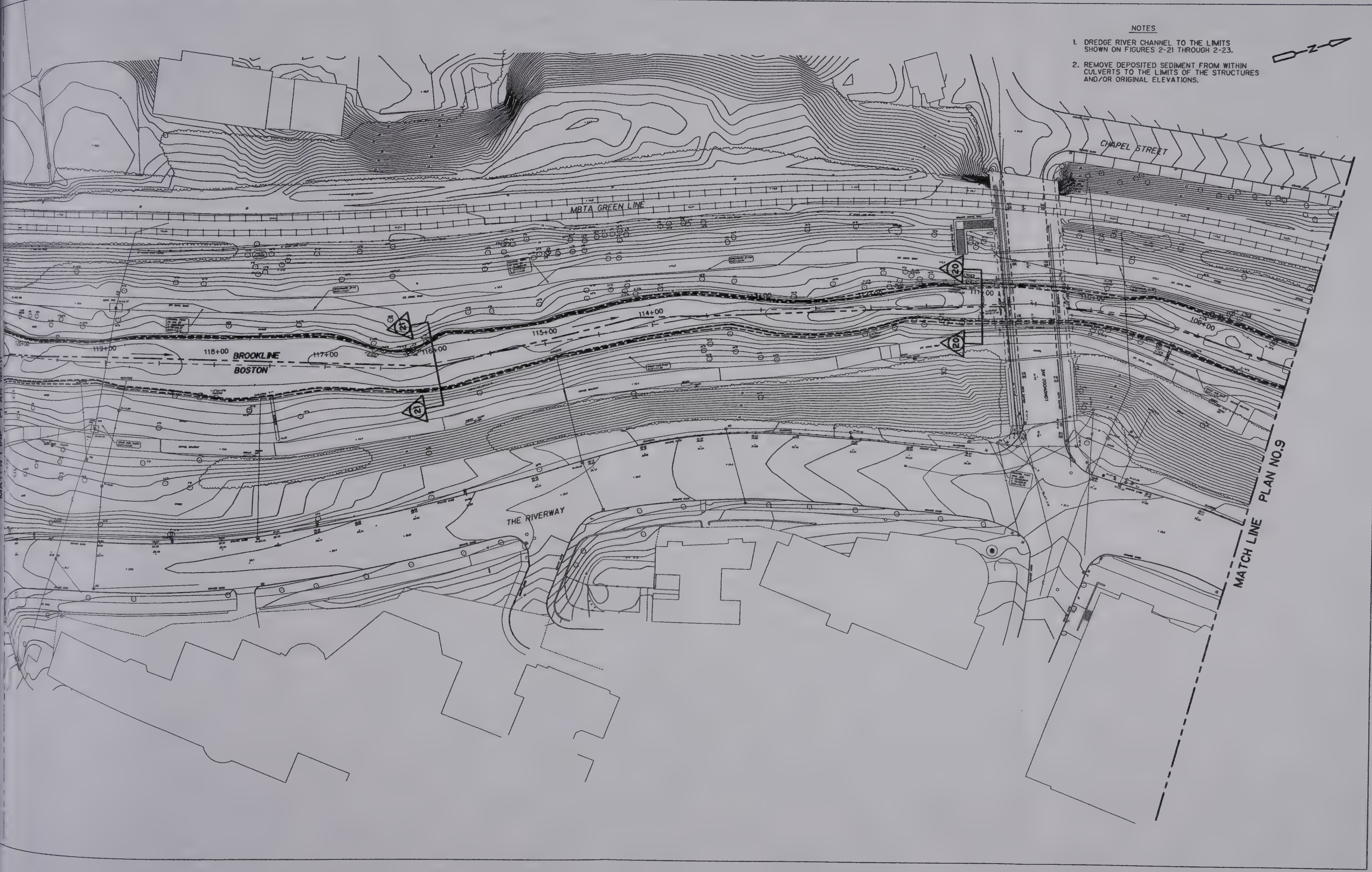
PROJECT NO.
FILE NAME:

SHEET NO.
2-15

R:\1517\28449\CIVL\CSTPL209

NOTES

1. DREDGE RIVER CHANNEL TO THE LIMITS SHOWN ON FIGURES 2-21 THROUGH 2-23.
2. REMOVE DEPOSITED SEDIMENT FROM WITHIN CULVERTS TO THE LIMITS OF THE STRUCTURES AND/OR ORIGINAL ELEVATIONS.



DESIGNED BY:	J. STEELE
DRAWN BY:	R. DEARDON
SHEET CHK'D BY:	
CROSS CHK'D BY:	
APPROVED BY:	
DATE:	APRIL 2001

REMARKS

CDM Camp Dresser & McKee Inc.

MUDDY RIVER RESTORATION PROJECT

PLAN NO. 10

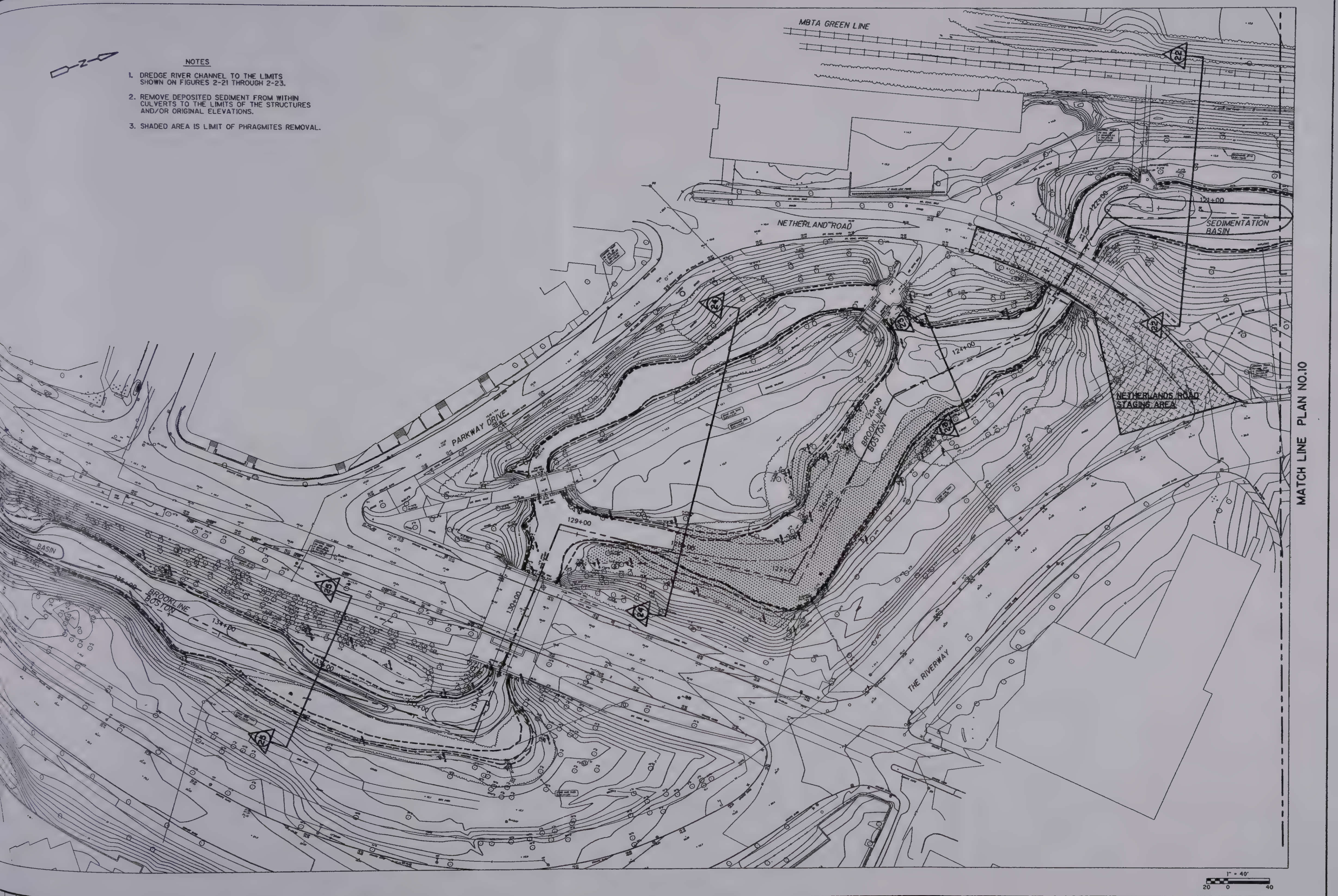
PROJECT NO.
FILE NAME:

SHEET NO.
2-16

R:\1517\28449\CIVIL\CSTPL210

NOTES

1. DREDGE RIVER CHANNEL TO THE LIMITS SHOWN ON FIGURES 2-21 THROUGH 2-23.
2. REMOVE DEPOSITED SEDIMENT FROM WITHIN CULVERTS TO THE LIMITS OF THE STRUCTURES AND/OR ORIGINAL ELEVATIONS.
3. SHADED AREA IS LIMIT OF PHRAGMITES REMOVAL.



DESIGNED BY:	J. STEELE
DRAWN BY:	R. DEARDON
SHEET CHK'D BY:	
CROSS CHK'D BY:	
APPROVED BY:	
DATE:	APRIL 2001

REMARKS

CDM Camp Dresser & McKee Inc.

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engineering
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operations

MUDDY RIVER RESTORATION PROJECT

PLAN NO. 11

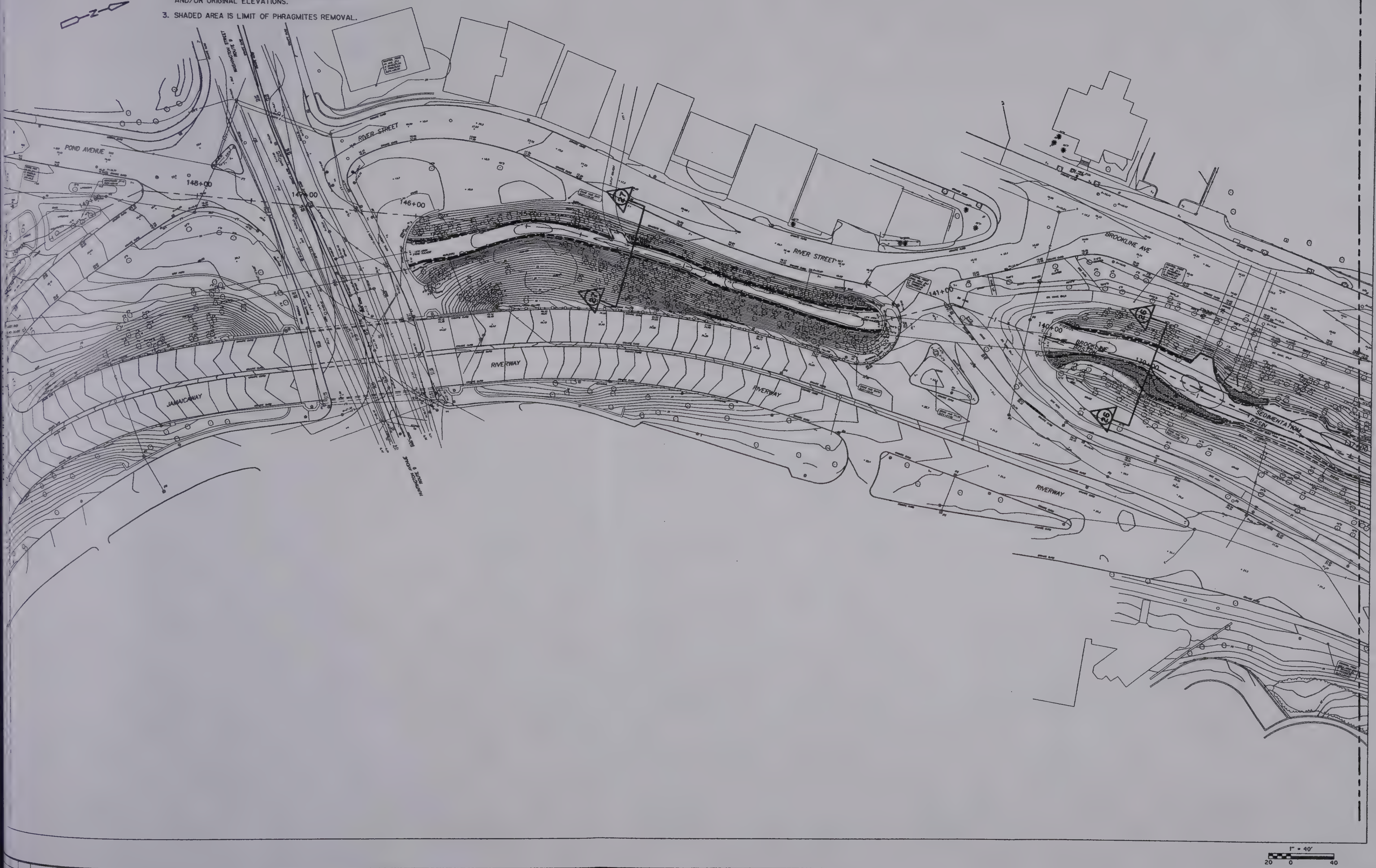
PROJECT NO.
FILE NAME:

SHEET NO.
2-17

R:\1517\28449\CIVIL\CSTPL211

NOTES

1. DREDGE RIVER CHANNEL TO THE LIMITS SHOWN ON FIGURES 2-21 THROUGH 2-23.
2. REMOVE DEPOSITED SEDIMENT FROM WITHIN CULVERTS TO THE LIMITS OF THE STRUCTURES AND/OR ORIGINAL ELEVATIONS.
3. SHADED AREA IS LIMIT OF PHRAGMITES REMOVAL.



DESIGNED BY:	J. STEELE
DRAWN BY:	R. DEARDON
SHEET CHK'D BY:	
CROSS CHK'D BY:	
APPROVED BY:	
DATE:	APRIL 2001

REMARKS

DWG

CDM Camp Dresser & McKee Inc.

consulting engineering construction operations

MUDDY RIVER RESTORATION PROJECT

PLAN NO. 12

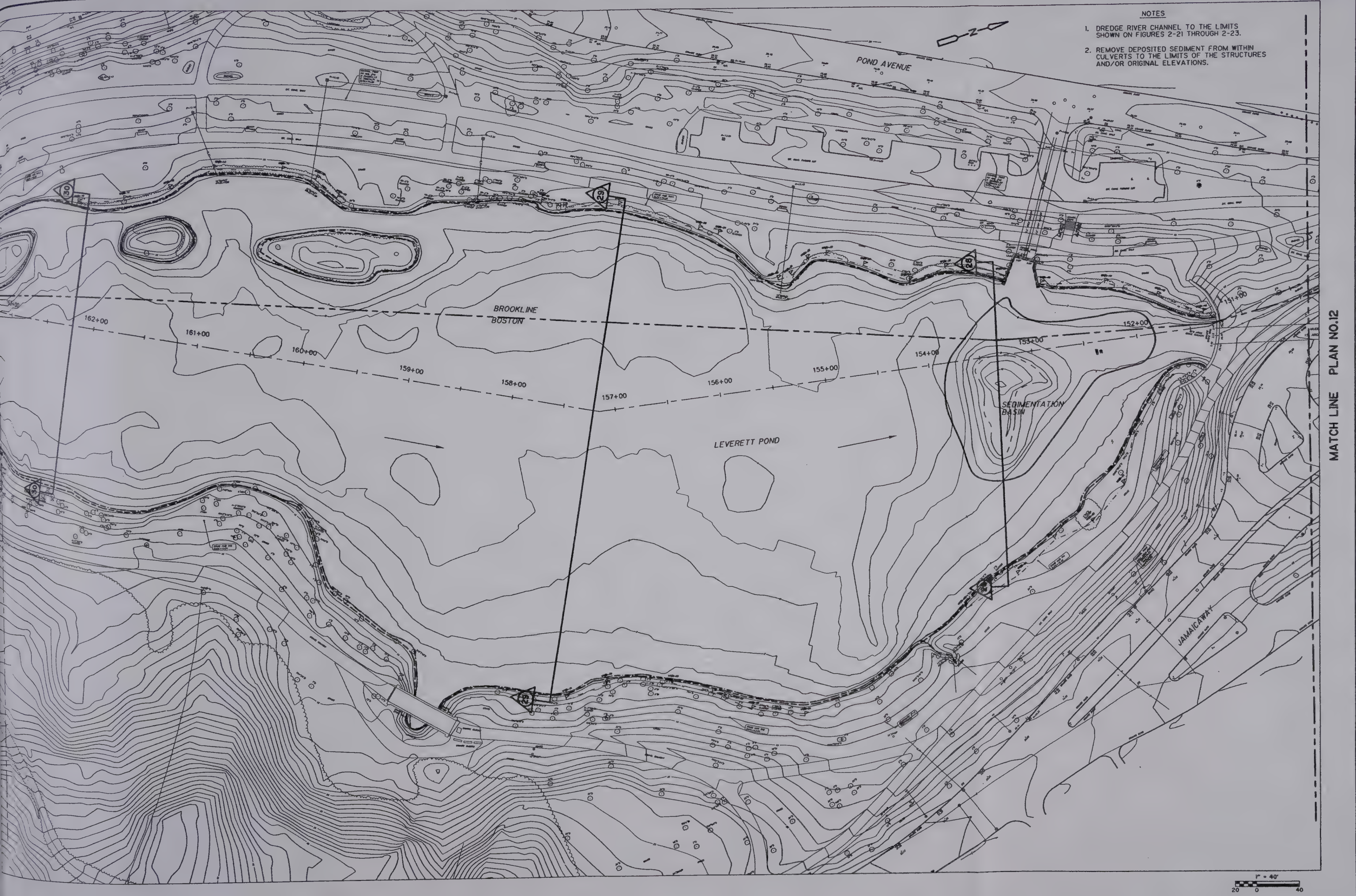
PROJECT NO.
FILE NAME:

SHEET NO.
2-18

R:\1517\28449\CIVL\CSTPL212

NOTES

1. DREDGE RIVER CHANNEL TO THE LIMITS SHOWN ON FIGURES 2-21 THROUGH 2-23.
2. REMOVE DEPOSITED SEDIMENT FROM WITHIN CULVERTS TO THE LIMITS OF THE STRUCTURES AND/OR ORIGINAL ELEVATIONS.



DATE	DRWN	CHKD	REMARKS

DESIGNED BY: J. STEELE
DRAWN BY: R. DEARDON
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: APRIL 2001

CDM Camp Dresser & McKee Inc.

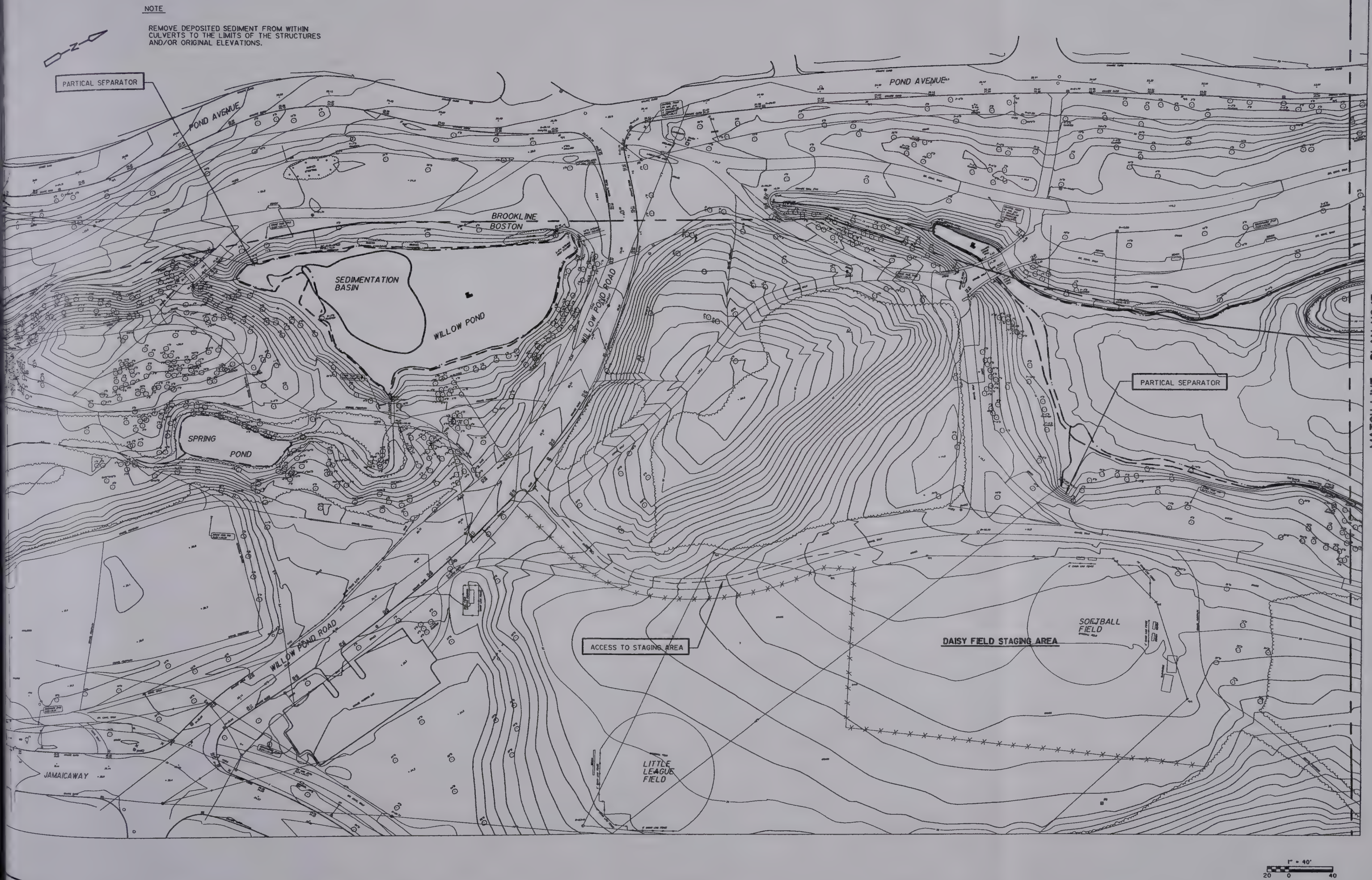
MUDDY RIVER RESTORATION PROJECT

PLAN NO. 13

PROJECT NO.
FILE NAME:

SHEET NO.
2-19

R:\1517\28449\CIVL\CSTPL213



NOTE

REMOVE DEPOSITED SEDIMENT FROM WITHIN CULVERTS TO THE LIMITS OF THE STRUCTURES AND/OR ORIGINAL ELEVATIONS.

DESIGNED BY:	J. STEELE
DRAWN BY:	R. DEARDON
SHEET CHK'D BY:	
CROSS CHK'D BY:	
APPROVED BY:	
DATE:	APRIL 2001

REMARKS

CDM Camp Dresser & McKee Inc.

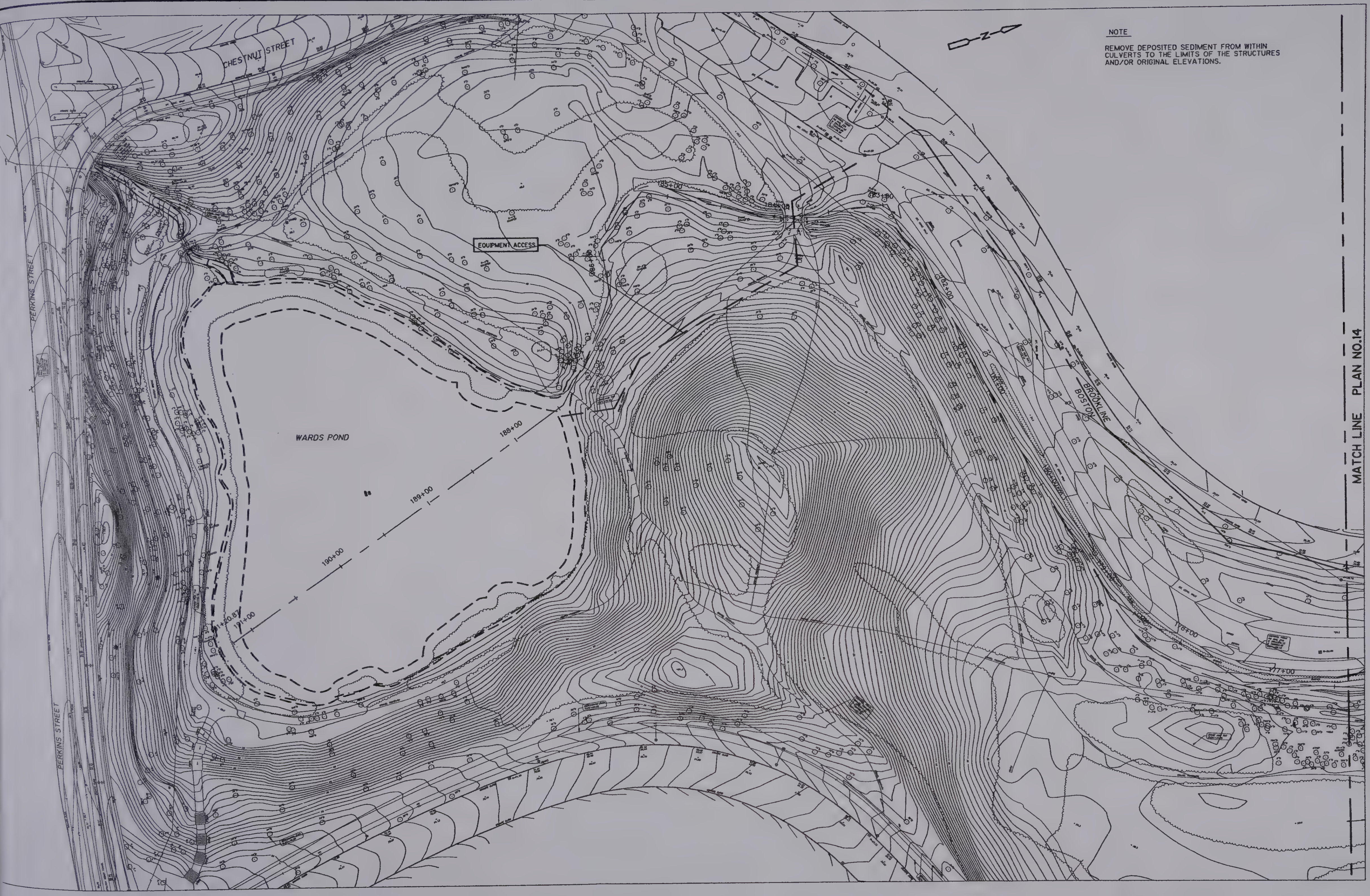
MUDDY RIVER RESTORATION PROJECT

PLAN NO.14

PROJECT NO.
FILE NAME:

SHEET NO.
2-20

R:\1517\28449\CIVL\CSTPL214



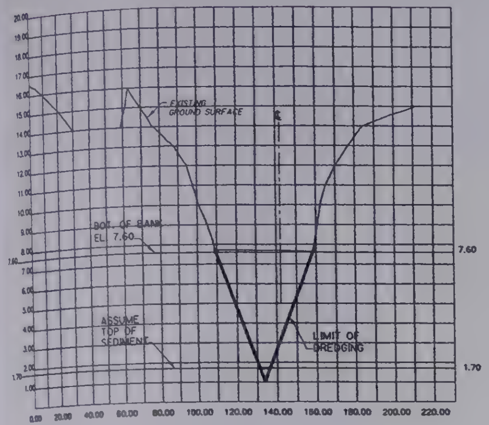
NOTE

REMOVE DEPOSITED SEDIMENT FROM WITHIN CULVERTS TO THE LIMITS OF THE STRUCTURES AND/OR ORIGINAL ELEVATIONS.

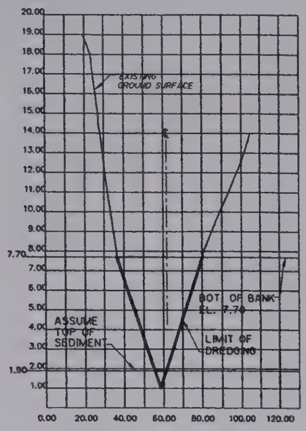
DESIGNED BY: J. STEELE	**CDM** Camp Dresser & McKee Inc. consulting engineering construction operations	PROJECT NO. FILE NAME:
DRAWN BY: R. DEARDON	**MUDDY RIVER RESTORATION PROJECT**	SHEET NO.
SHEET CHK'D BY:	**PLAN NO.15**	**2-21**
CROSS CHK'D BY:		
APPROVED BY:		
DATE: APRIL 2001		

DSGN DRWN CHKD REMARKS

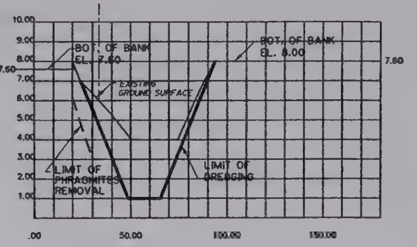
R:\1517\28449\CIVL\CSTPL215



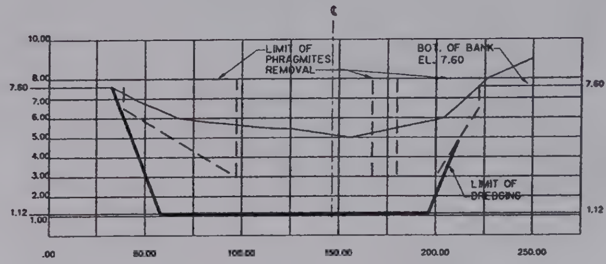
SECTION 1 / 1



SECTION 2 / 1



SECTION 3 / 2



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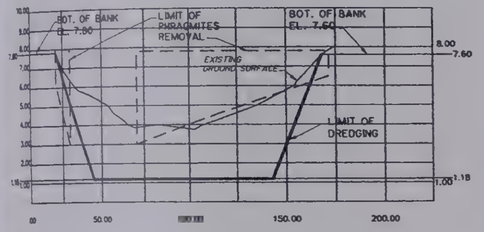

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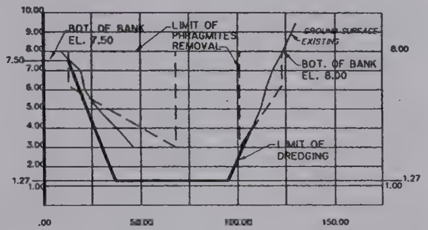

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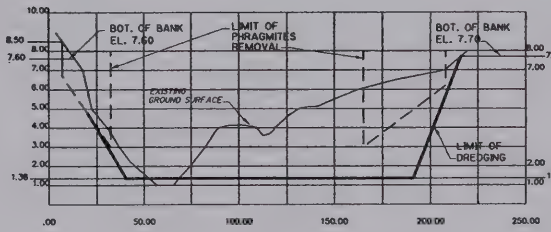

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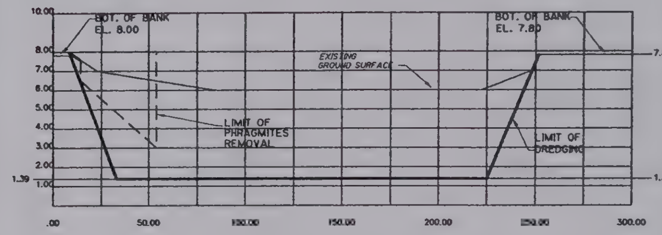

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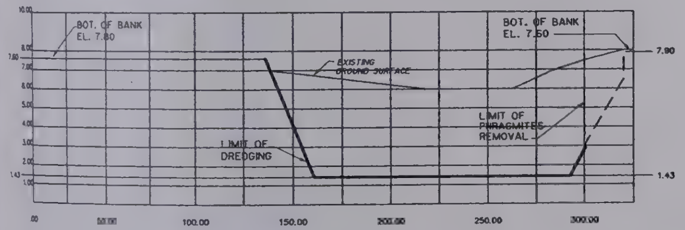
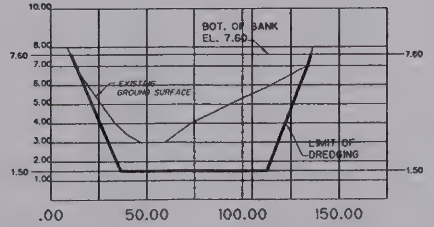


SECTION 8B / 4



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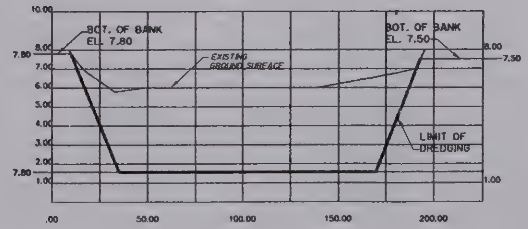

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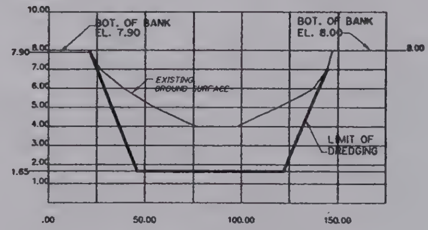
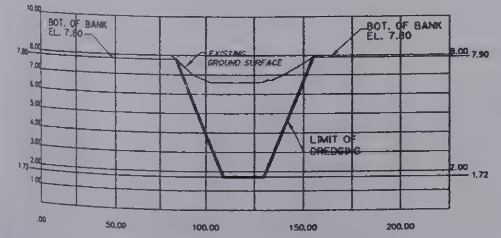


SECTION 11 / 5



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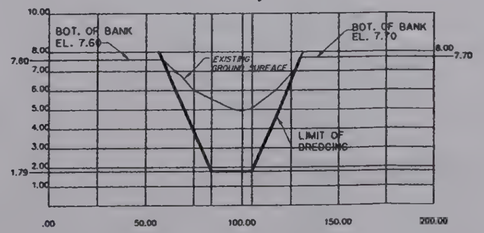

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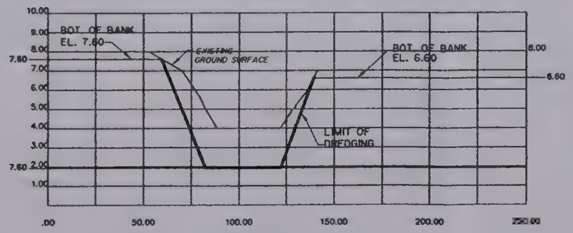
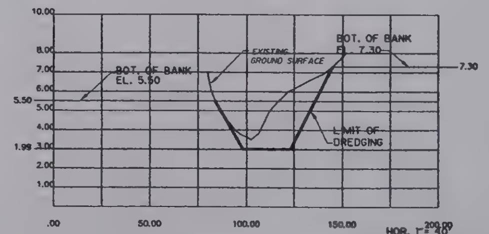


SECTION 14 / 7



SECTION 15 / 7

HOR. 1" = 40'
20 0 40

VER. 1" = 4'
2 0 4

VERTICAL DATUM: BOSTON CITY BASE (BCB)

DESIGNED BY:
DRAWN BY:
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: APRIL 2001

REMARKS

CDM Camp Dresser & McKee Inc.

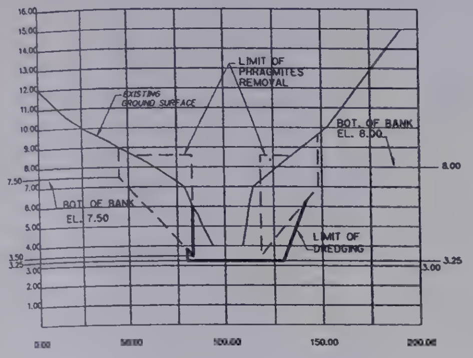
MUDDY RIVER RESTORATION PROJECT

SITE SECTIONS I

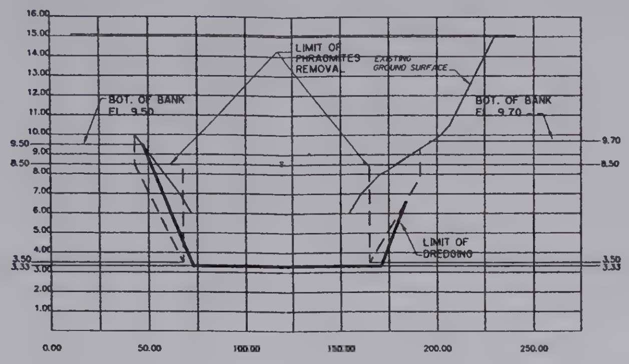
PROJECT NO.
FILE NAME:

SHEET NO.
2-22

C:\PROJECTS\1517\28449\CIVIL\CSTSC001.DWG 11-2-00 1:35:19 pm EST



SECTION 16/8



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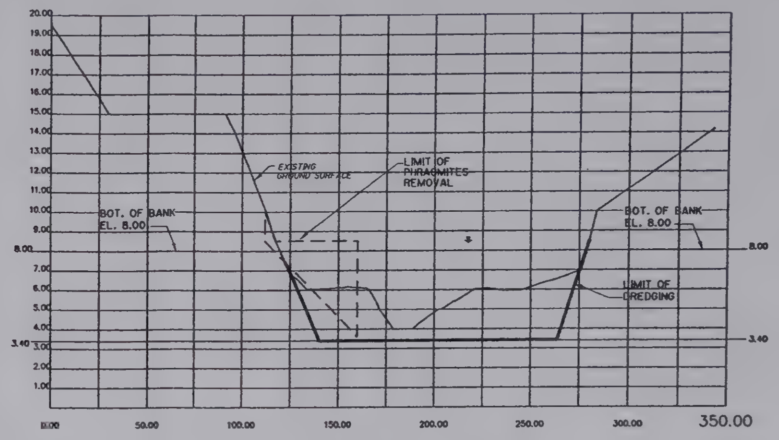

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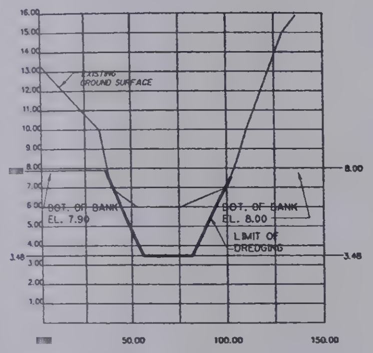

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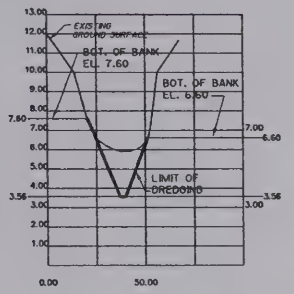

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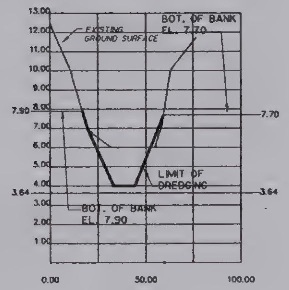

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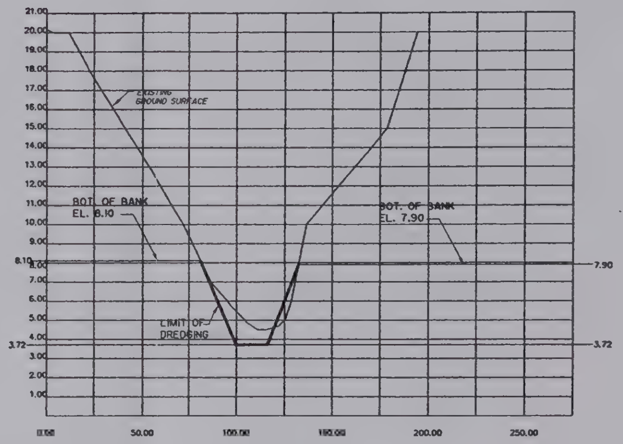

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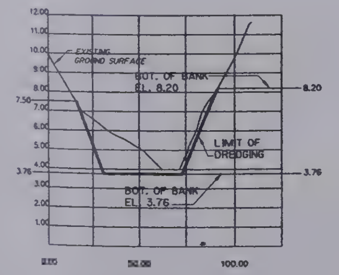

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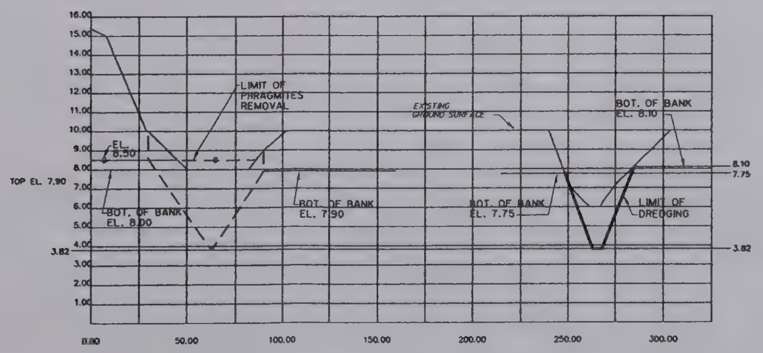


SECTION 24/11

HOR. 1" = 40'
20 0 40
VER. 1" = 4'
2 0 4

VERTICAL DATUM: BOSTON CITY BASE (BCB)

DESIGNED BY:	J. STEEL
DRAWN BY:	M. TOUAYL
SHEET CHK'D BY:	
CROSS CHK'D BY:	
APPROVED BY:	
DATE:	APRIL 2001

REMARKS

CDM Camp Dresser & McKee Inc.

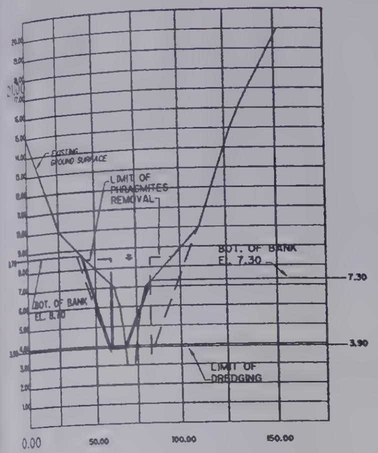
MUDDY RIVER RESTORATION PROJECT

SITE SECTIONS II

PROJECT NO.
FILE NAME:

SHEET NO.
2-23

C:\PROJECTS\1517\28449\CIVIL\CSTSC002.DWG 11-2-00 2:58:20 pm EST



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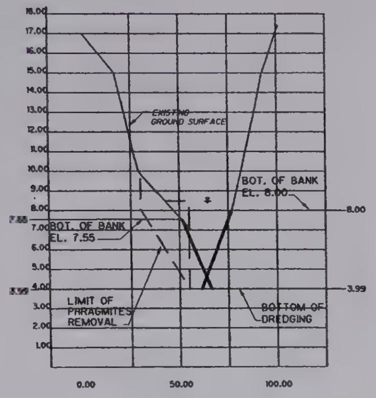

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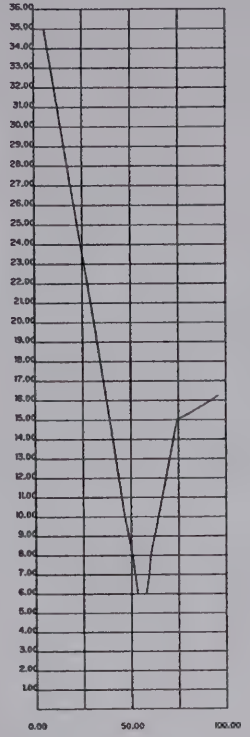

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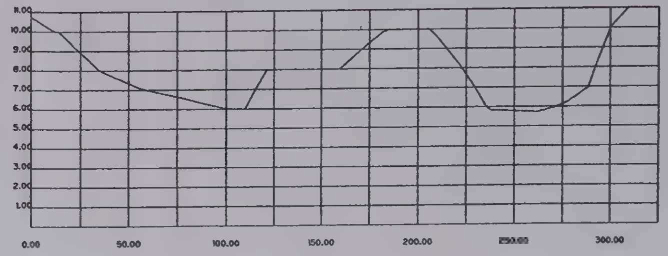

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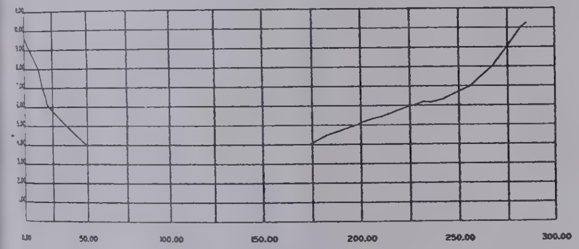

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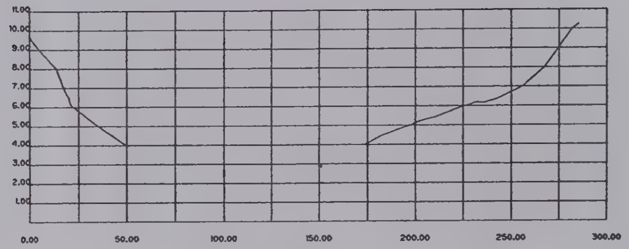

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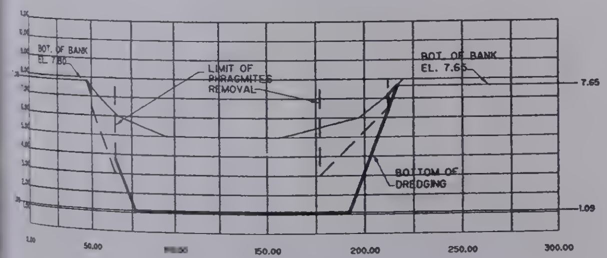
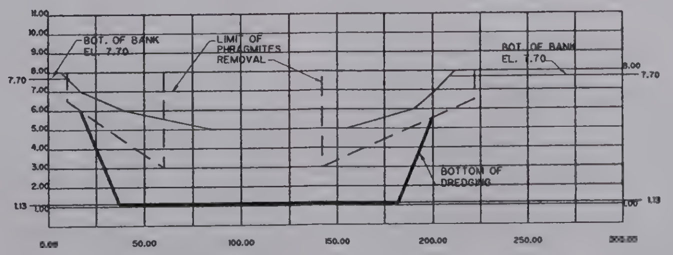
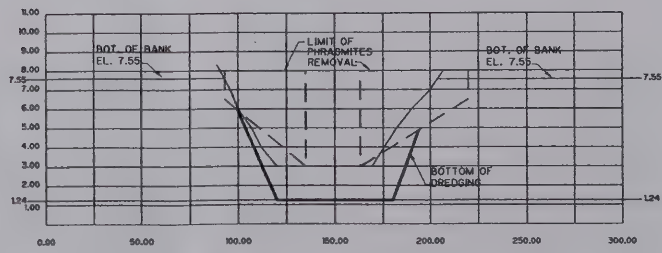


STA.19+00 31/1



SECTION 32/1



SECTION 33/1

HOR. 1" = 40'
20 0 40

VER. 1" = 4'
2 0 4

VERTICAL DATUM: BOSTON CITY BASE (BCB)

REMARKS

DESIGNED BY: J. STEEL
DRAWN BY: M. TOUAYL
SHEET CHK'D BY:
CROSS CHK'D BY:
APPROVED BY:
DATE: APRIL 2001

CDM Camp Dresser & McKee Inc.

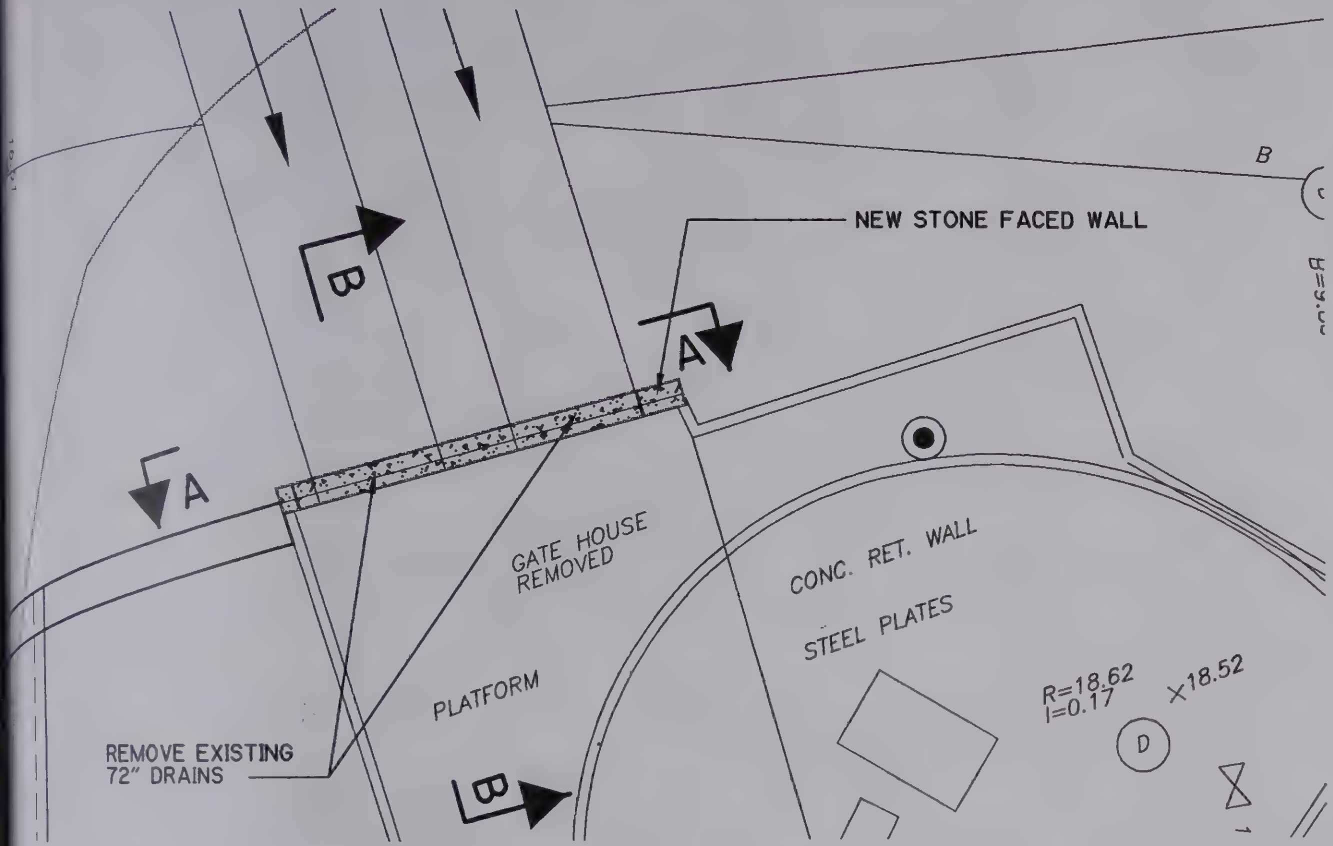
MUDDY RIVER RESTORATION PROJECT

SITE SECTIONS III

PROJECT NO.
FILE NAME:

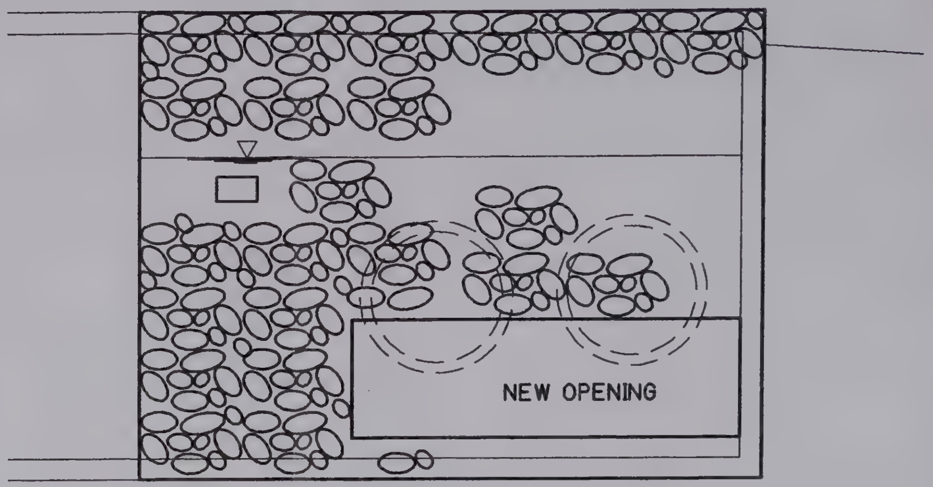
SHEET NO.
2-24

C:\PROJECTS\1517\28449\CIVIL\CSTSC003.DWG 11-2-00 2:42:00 pm EST



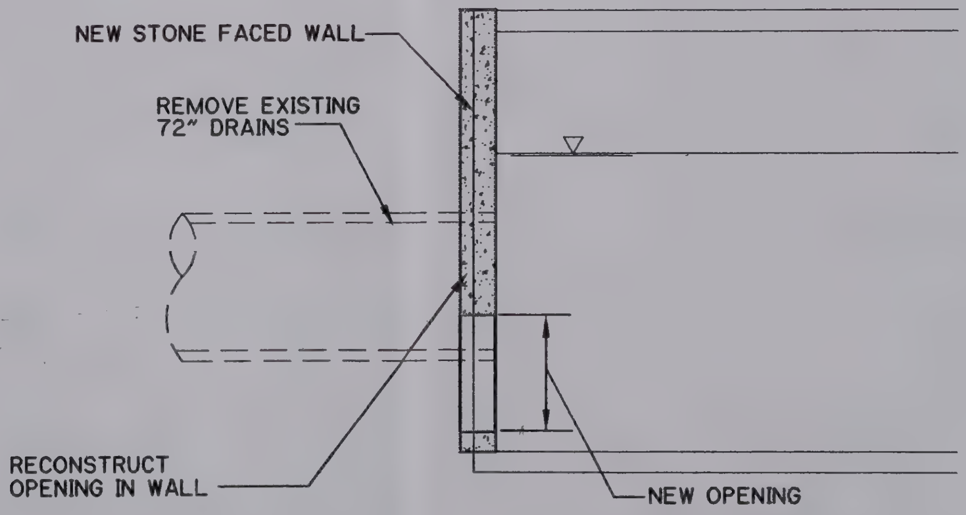
PLAN

SCALE: 1" = 8'



SECTION A-A

SCALE: 1" = 8'



SECTION B-B

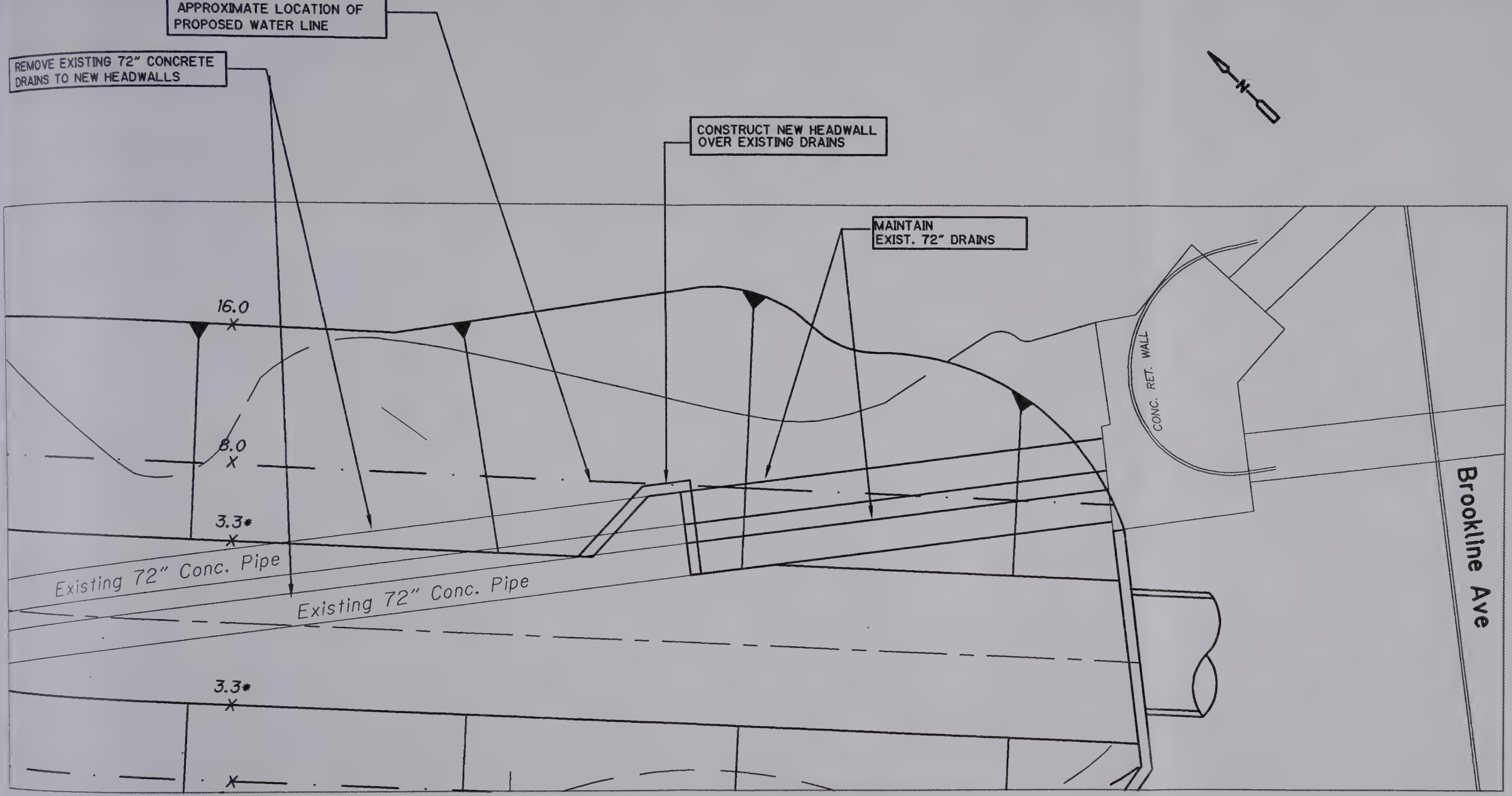
SCALE: 1" = 8'

Camp Dresser & McKee Inc.

MUDDY RIVER RESTORATION PROJECT

FIGURE 3-1

PROPOSED MODIFICATIONS UNDER FACE OF GATEHOUSE


APPROXIMATE LOCATION OF PROPOSED WATER LINE
REMOVE EXISTING 72" CONCRETE DRAINS TO NEW HEADWALLS
CONSTRUCT NEW HEADWALL OVER EXISTING DRAINS
MAINTAIN EXIST. 72" DRAINS
N
16.0
8.0
3.3*
3.3*
Existing 72" Conc. Pipe
Existing 72" Conc. Pipe
CONC. RET. WALL
Brookline Ave

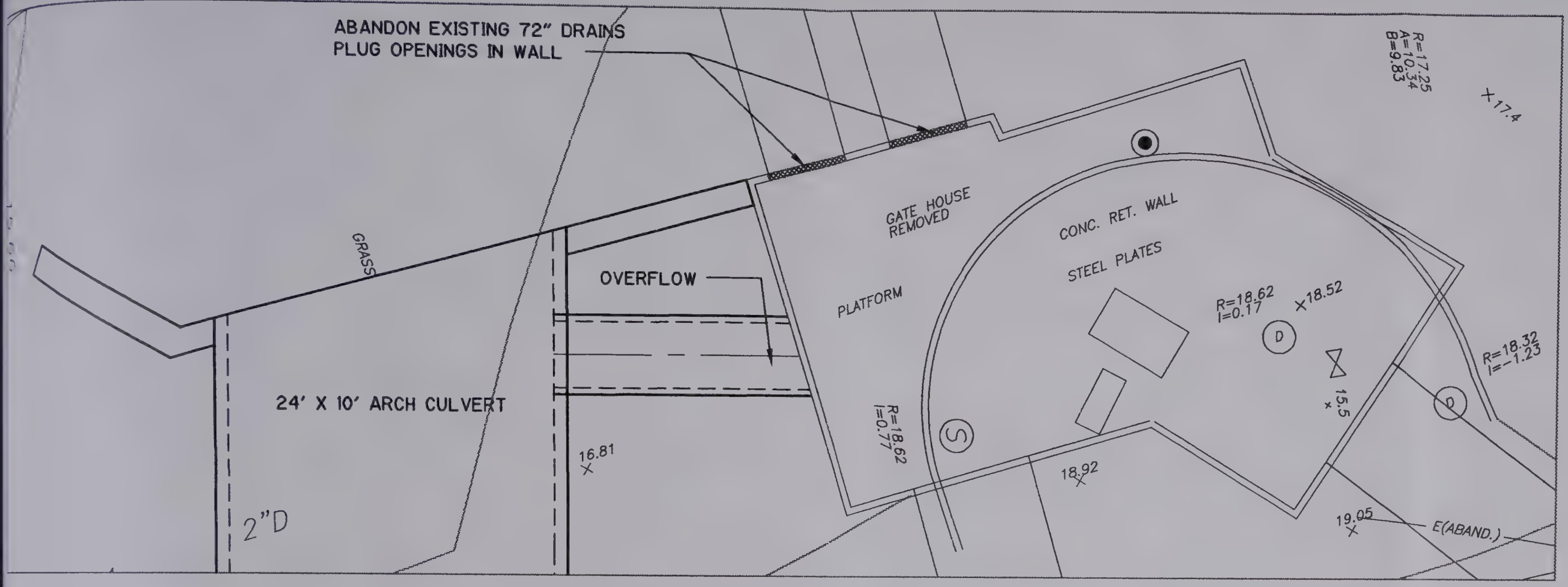
Camp Dresser & McKee Inc.

MUDDY RIVER RESTORATION PROJECT

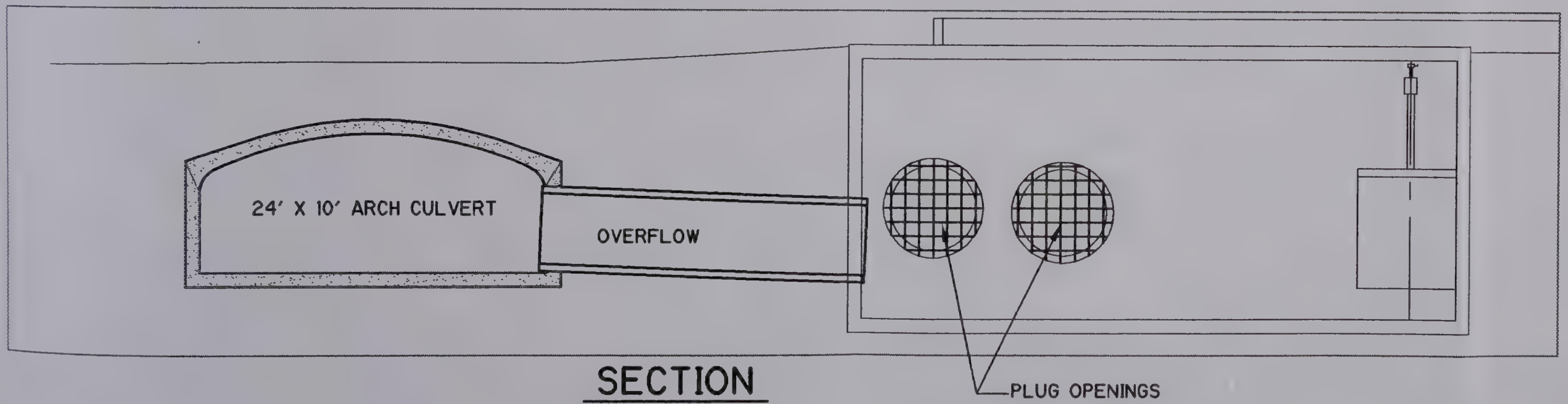
FIGURE 3-2

OVERFLOW TO GATE HOUSE (AS PROPOSED BY ARMY CORP. OF ENGINEERS)

R:\1517\28449\CIVL\CSTPL325



PLAN
SCALE: 1" = 8'



SECTION
SCALE: 1" = 8'

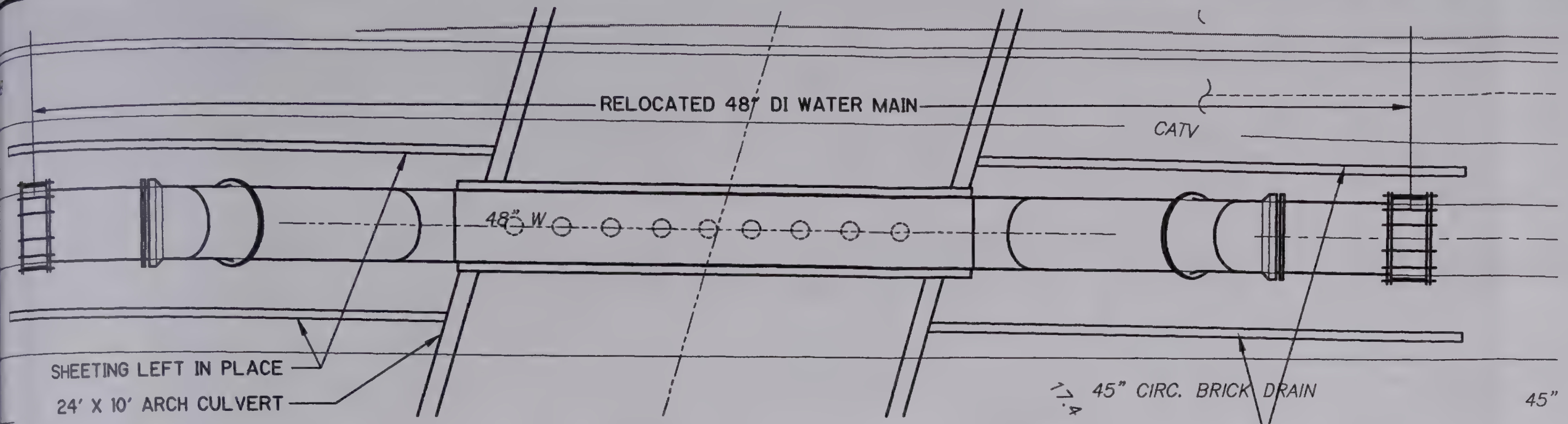
Camp Dresser & McKee Inc.

MUDDY RIVER RESTORATION PROJECT

FIGURE 3-3

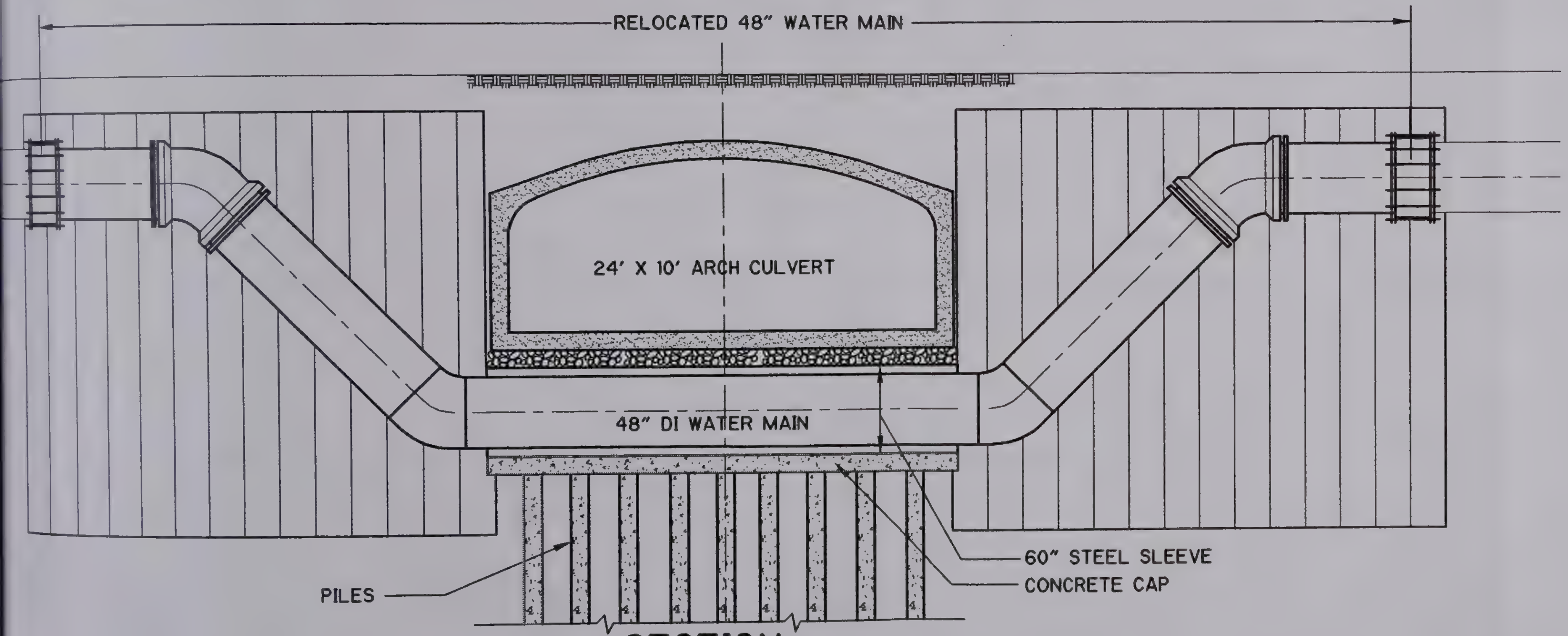
PROPOSED OVERFLOW CONNECTION TO CULVERT

R:\1517\28449\CIVL\CSTPL323



PLAN

SCALE: 1/8" = 1'-0"



SECTION

SCALE: 1/8" = 1'-0"

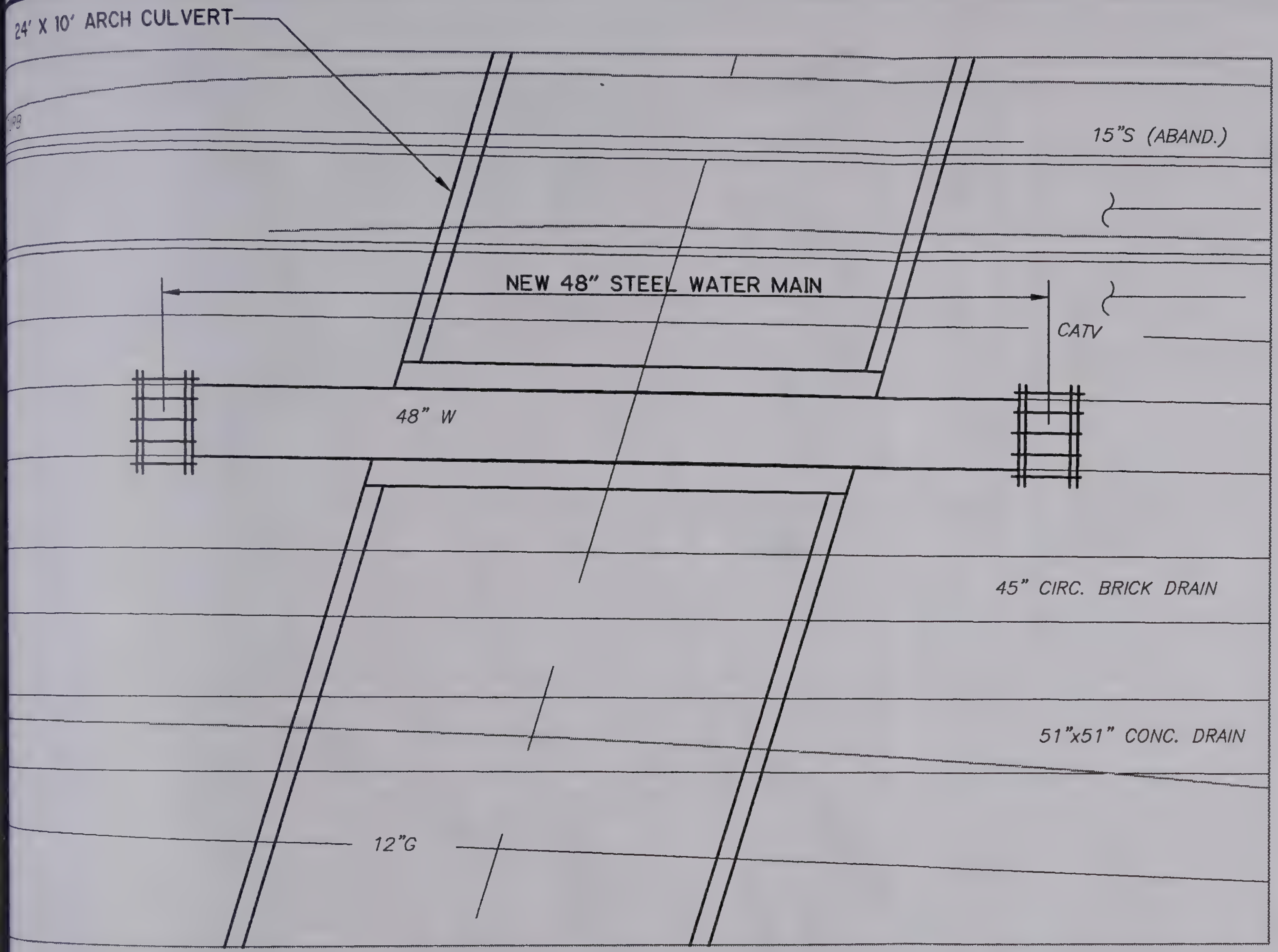
Camp Dresser & McKee Inc.

MUDDY RIVER RESTORATION PROJECT

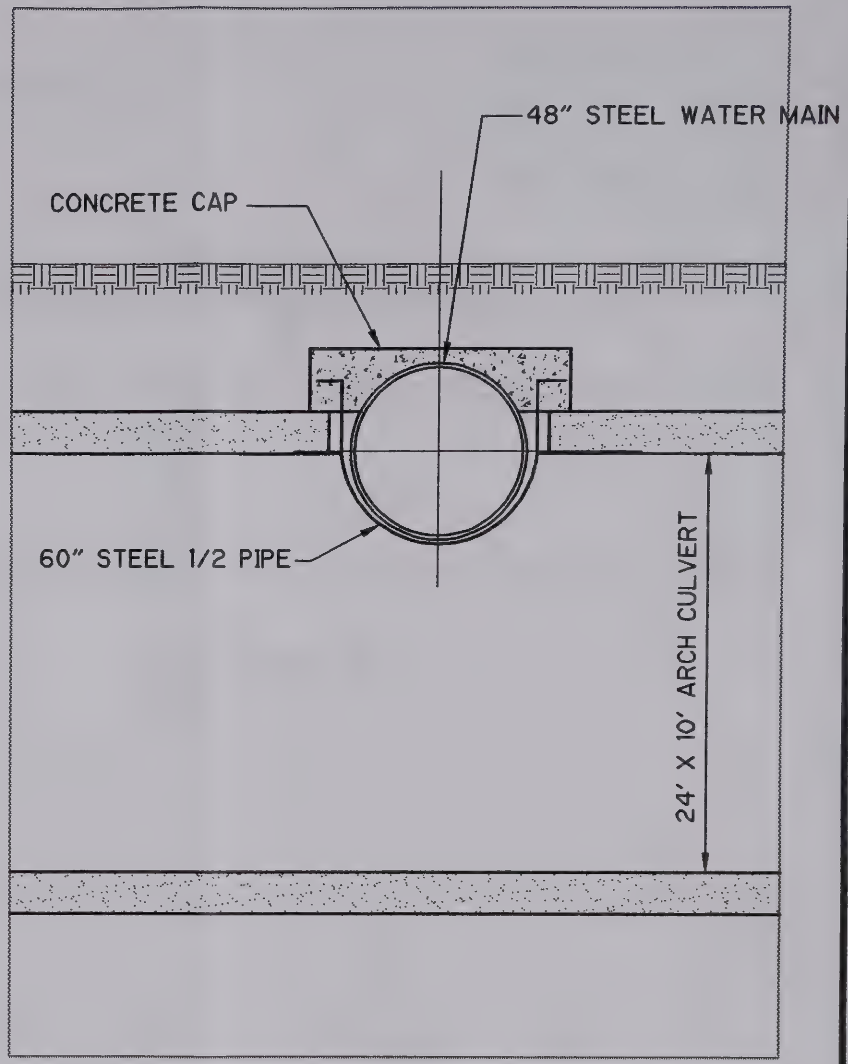
FIGURE 3-4

PROPOSED 48" WATER MAIN
CULVERT CROSSING

R:\1517\28449\CIVL\CSTPL321



PLAN
SCALE: 1" = 8'



SECTION
SCALE: 1" = 4'

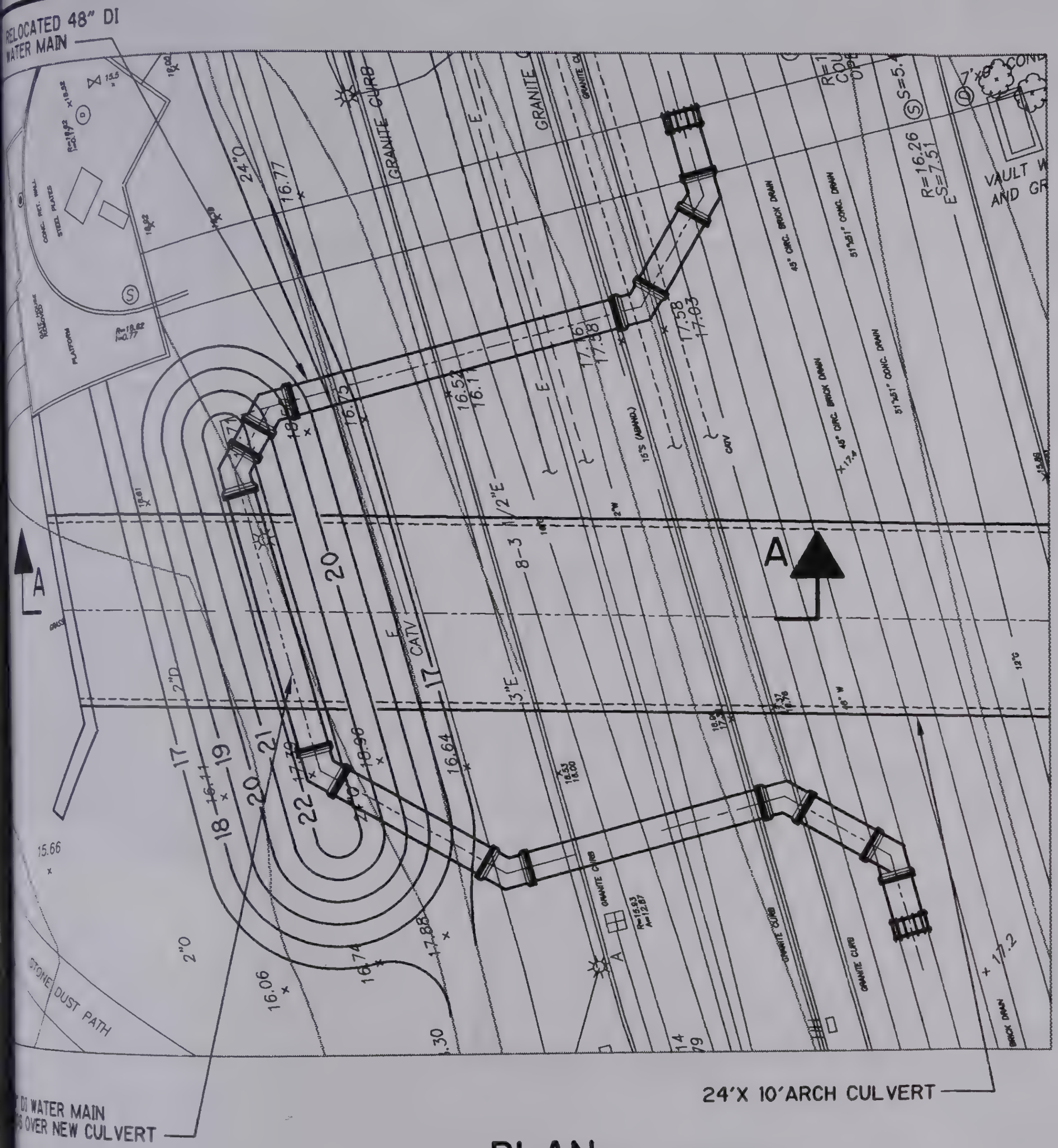
Camp Dresser & McKee Inc.

MUDDY RIVER RESTORATION PROJECT

FIGURE 3-5

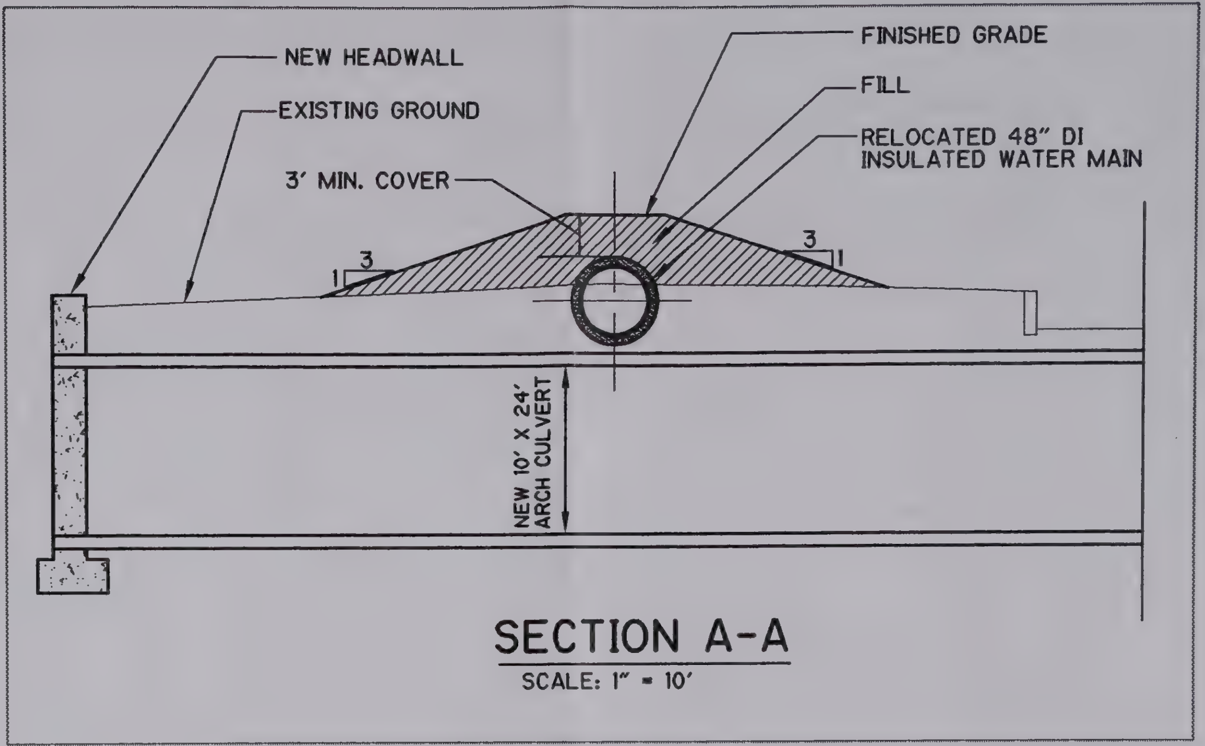
PROPOSED 48" WATER MAIN
CULVERT CROSSING

R:\1517\28449\CIVL\CSTPL320



PLAN

SCALE: 1" = 20'



SECTION A-A

SCALE: 1" = 10'

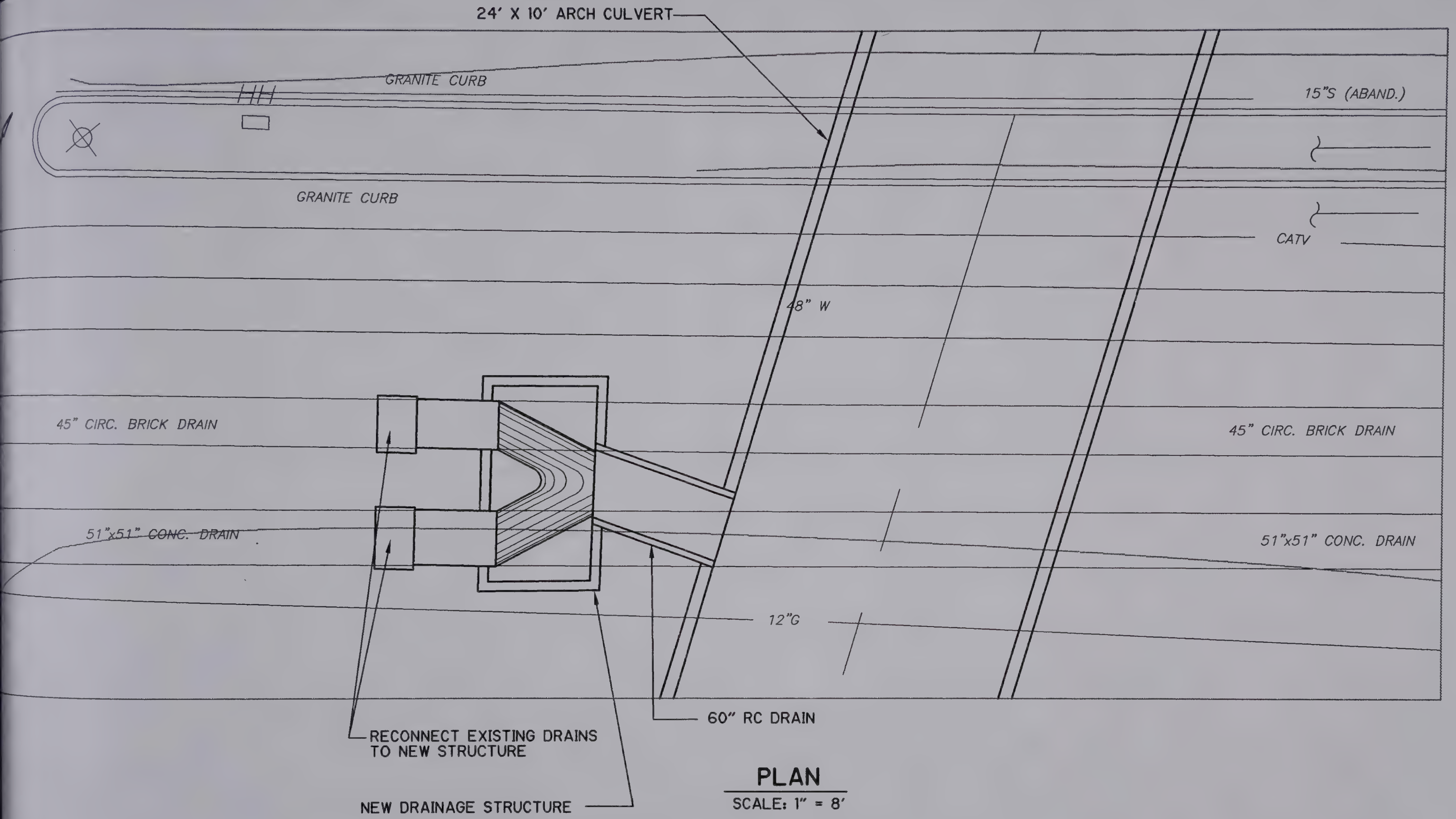
Camp Dresser & McKee Inc.

**MUDDY RIVER RESTORATION PROJECT
CULVERT REPLACEMENT**

FIGURE 3-6

**PROPOSED 48" WATER MAIN
CULVERT CROSSING**

R:\1517\28449\CIVL\CSTPL322



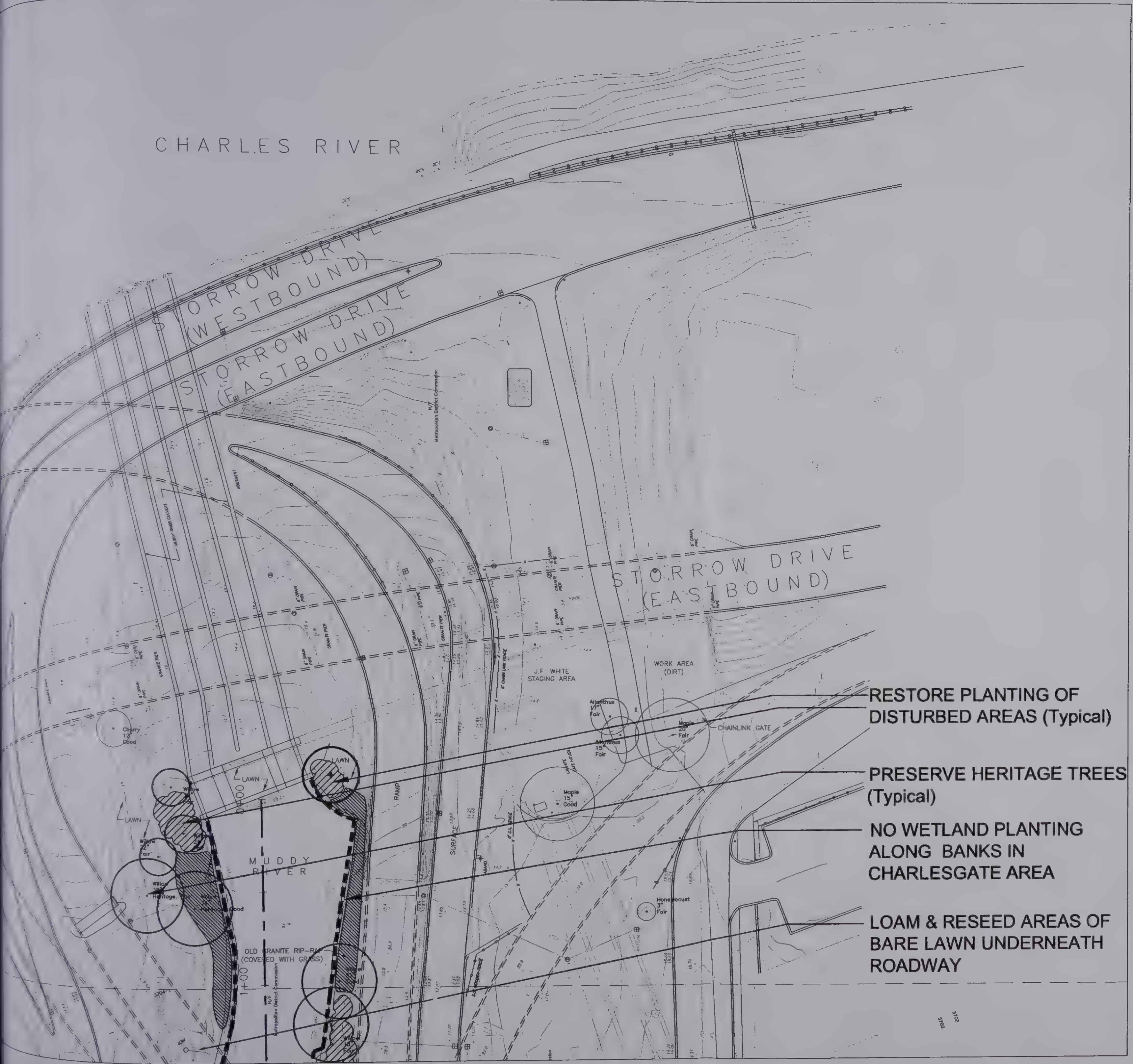
Camp Dresser & McKee Inc.

MUDDY RIVER RESTORATION PROJECT

FIGURE 3-7

PROPOSED DRAIN CONNECTIONS

R:\1517\28449\CIVL\CSTPL326


CHARLES RIVER
STORROW DRIVE (WESTBOUND)
STORROW DRIVE (EASTBOUND)
STORROW DRIVE (EASTBOUND)
J.F WHITE STAGING AREA
WORK AREA (DIRT)
CHAINLINK GATE
Ailanthus 17" Fair
Ailanthus 15" Fair
Maple 20" Fair
Maple 15" Good
GRANITE GATE HOUSE
Cherry 12" Good
Willow 22" Fair
Willow 38" Heritage
LAWN
LAWN
LAWN
0+00
1+00
MUDDY RIVER
OLD GRANITE RIP-RAP (COVERED WITH GRASS)
RAMP
SURFACE
Honeylocust 9" Fair
N/F Metropolitan District Commission
6" DRAIN PIPE
GRANITE PIER
RESTORE PLANTING OF DISTURBED AREAS (Typical)
PRESERVE HERITAGE TREES (Typical)
NO WETLAND PLANTING ALONG BANKS IN CHARLESGATE AREA
LOAM & RESEED AREAS OF BARE LAWN UNDERNEATH ROADWAY

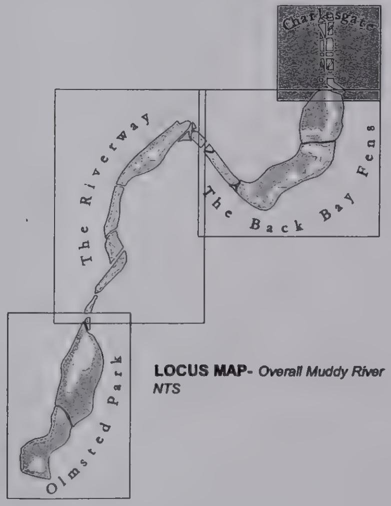
LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	- -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	▬

NOTES

1) All disturbed areas remaining after implementation of planting to be loamed and re-seeded (except where noted on drawings).

2) Appropriate wetland species to be planted along length of disturbed banks, to a width of 2'-0" (except where noted on drawings).



LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *Charlesgate*
NTS

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO.	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

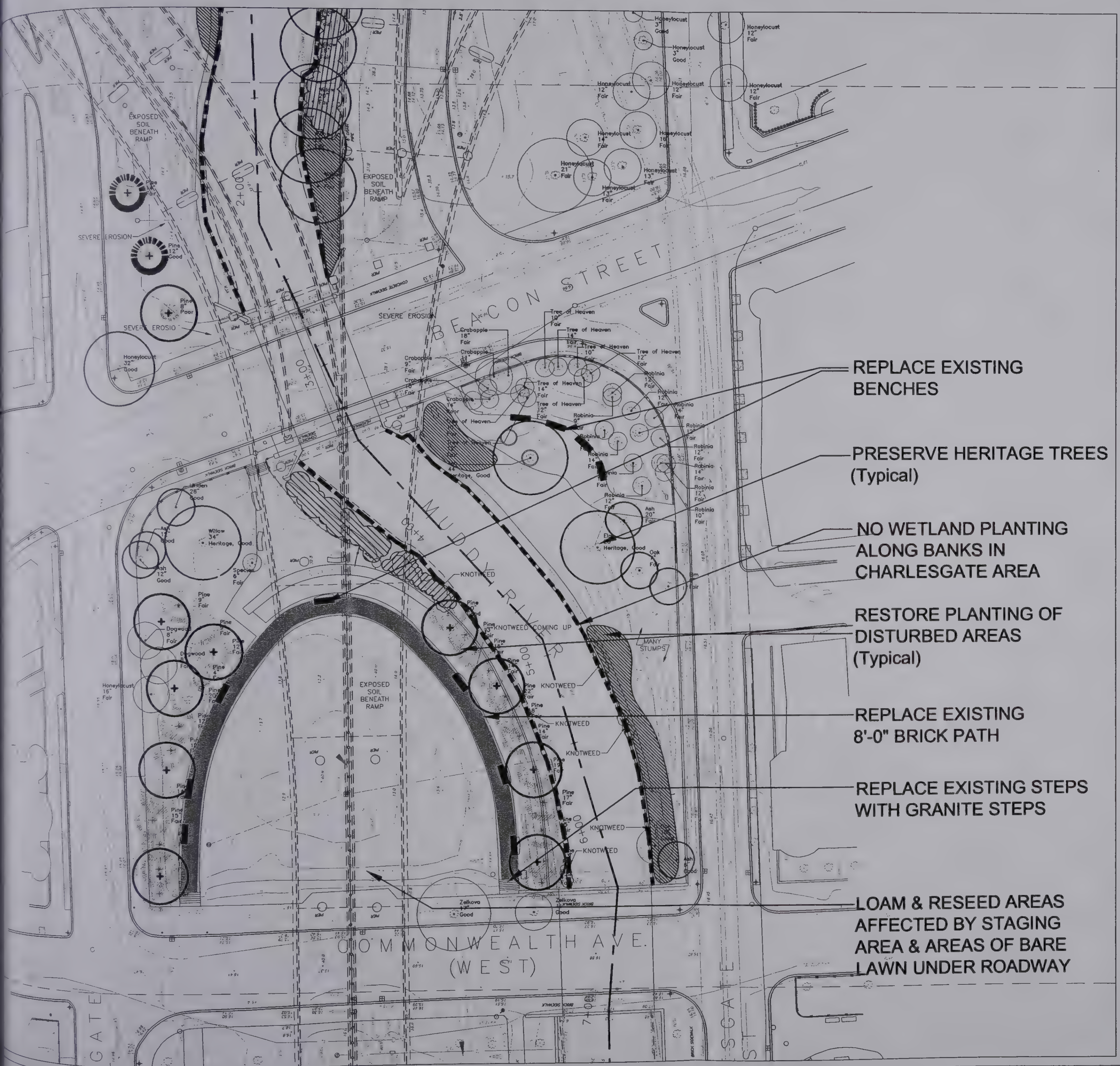
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC, SF
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L1



LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	- -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▧
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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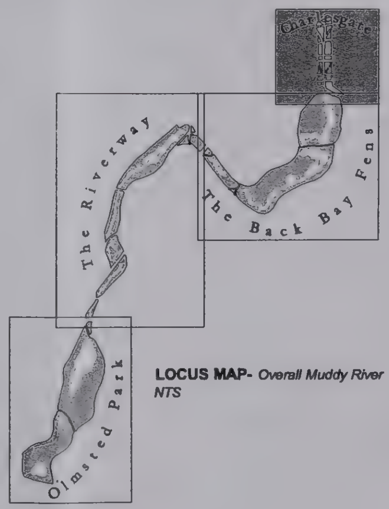

LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *Charlesgate*
NTS

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO.	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

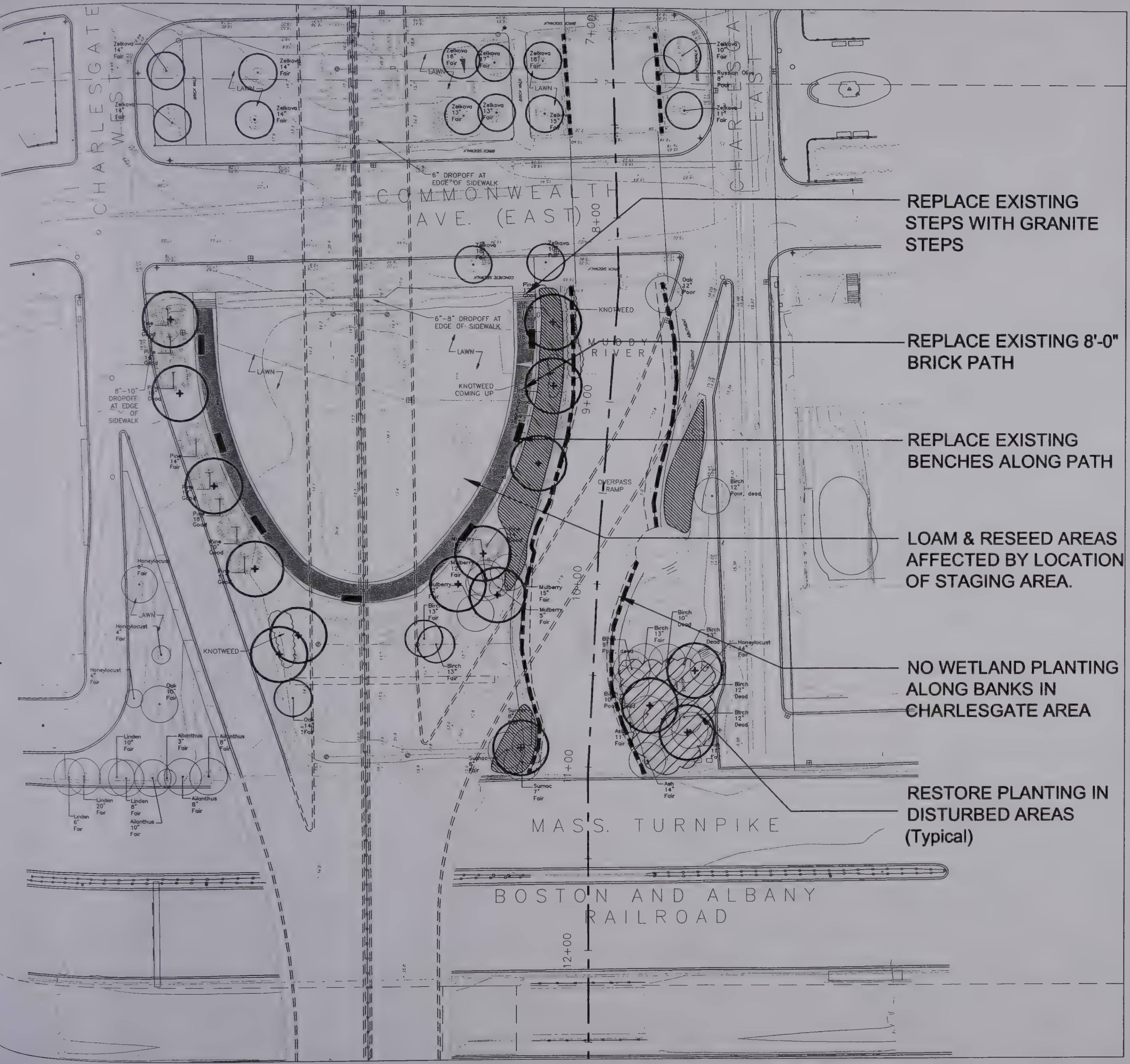
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: SF/MC
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L2



REPLACE EXISTING STEPS WITH GRANITE STEPS

REPLACE EXISTING 8'-0" BRICK PATH

REPLACE EXISTING BENCHES ALONG PATH

LOAM & RESEED AREAS AFFECTED BY LOCATION OF STAGING AREA.

NO WETLAND PLANTING ALONG BANKS IN CHARLESGATE AREA

RESTORE PLANTING IN DISTURBED AREAS (Typical)

LEGEND

PROPOSED SHORELINE LOCATION	～
EXISTING SHORELINE TO BE RETAINED	╌
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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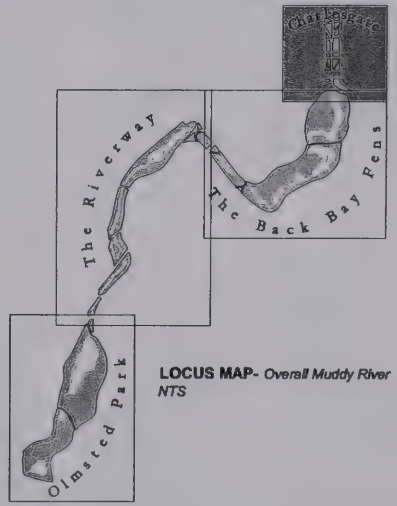

LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *Charlesgate*
NTS

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REVISIONS

NO.	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

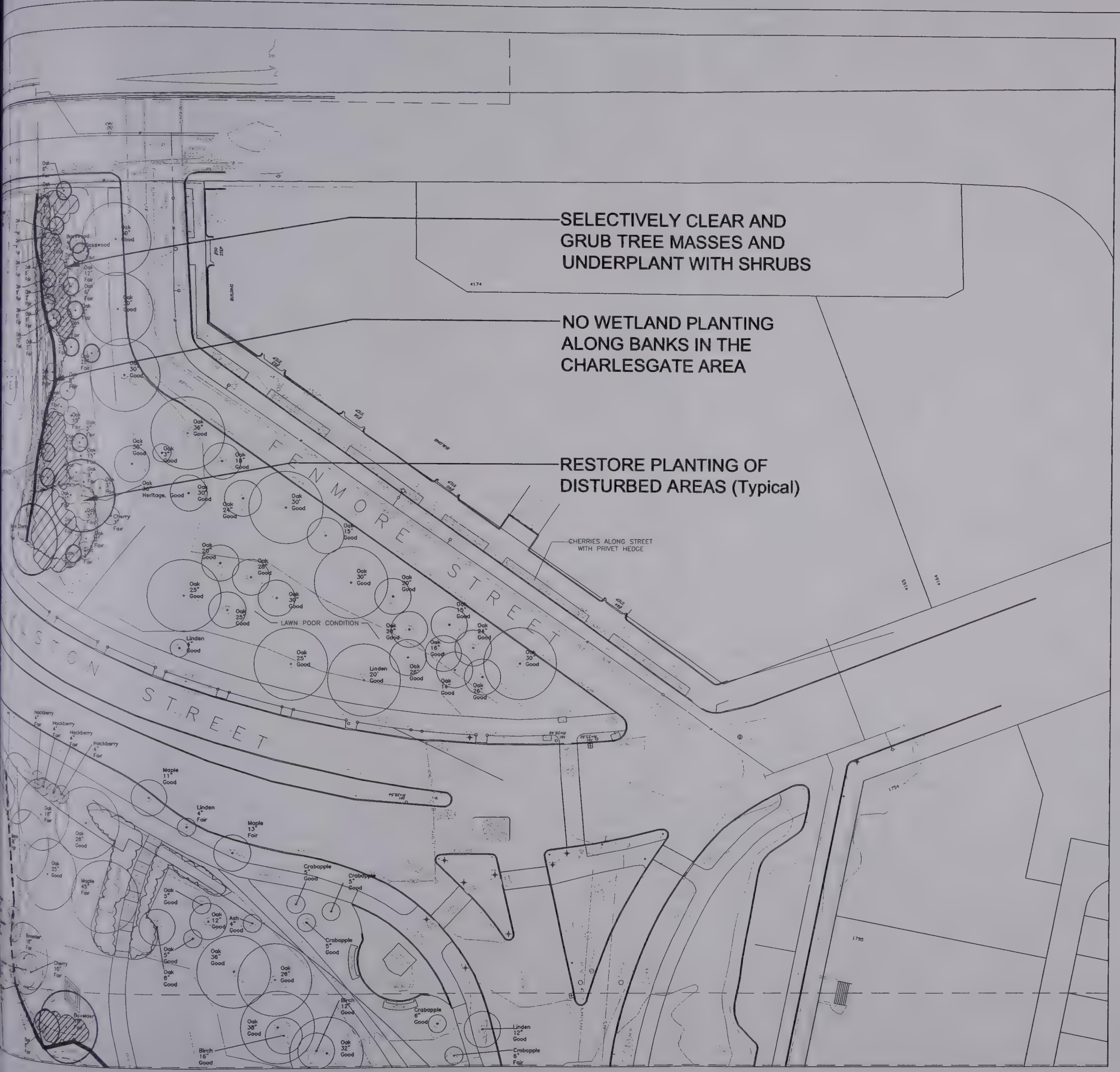
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=80'

DRAWING NO
L3



LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	~
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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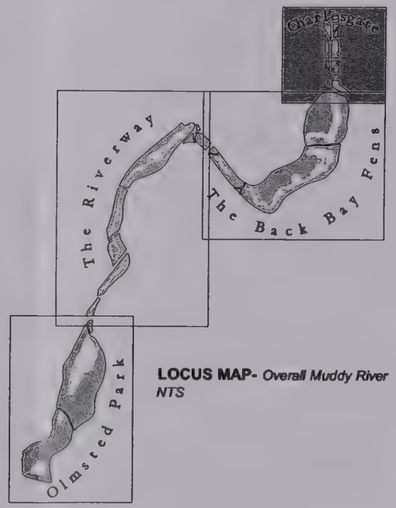

LOCUS MAP- *Overall Muddy River NTS*

LOCUS MAP- *Charlesgate NTS*

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO.	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

GRAPHIC SCALE 20 0 20 40

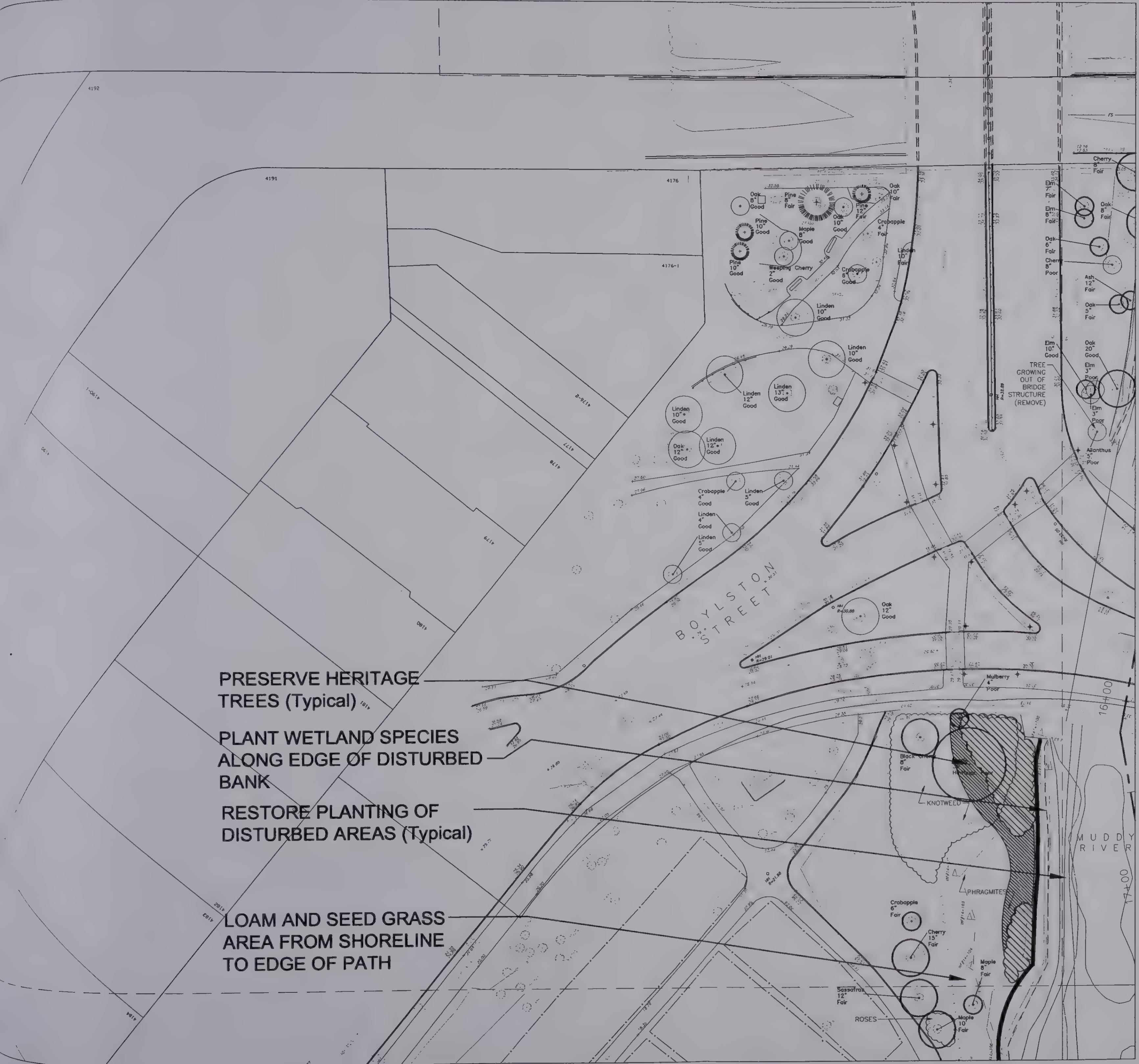
SEAL

NORTH

DRAWN BY: SF/MC
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=80'

DRAWING NO.

L4



PRESERVE HERITAGE TREES (Typical)

PLANT WETLAND SPECIES ALONG EDGE OF DISTURBED BANK

RESTORE PLANTING OF DISTURBED AREAS (Typical)

LOAM AND SEED GRASS AREA FROM SHORELINE TO EDGE OF PATH

LEGEND

PROPOSED SHORELINE LOCATION	∼
EXISTING SHORELINE TO BE RETAINED	- ∼ -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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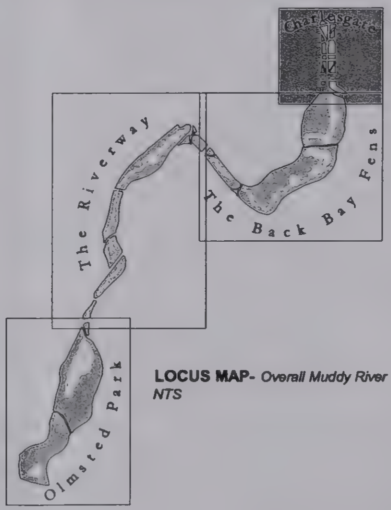

LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *Charlesgate*
NTS

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO.	DATE	REMARKS

DRAWING TITLE

PRELIMINARY
DESIGN

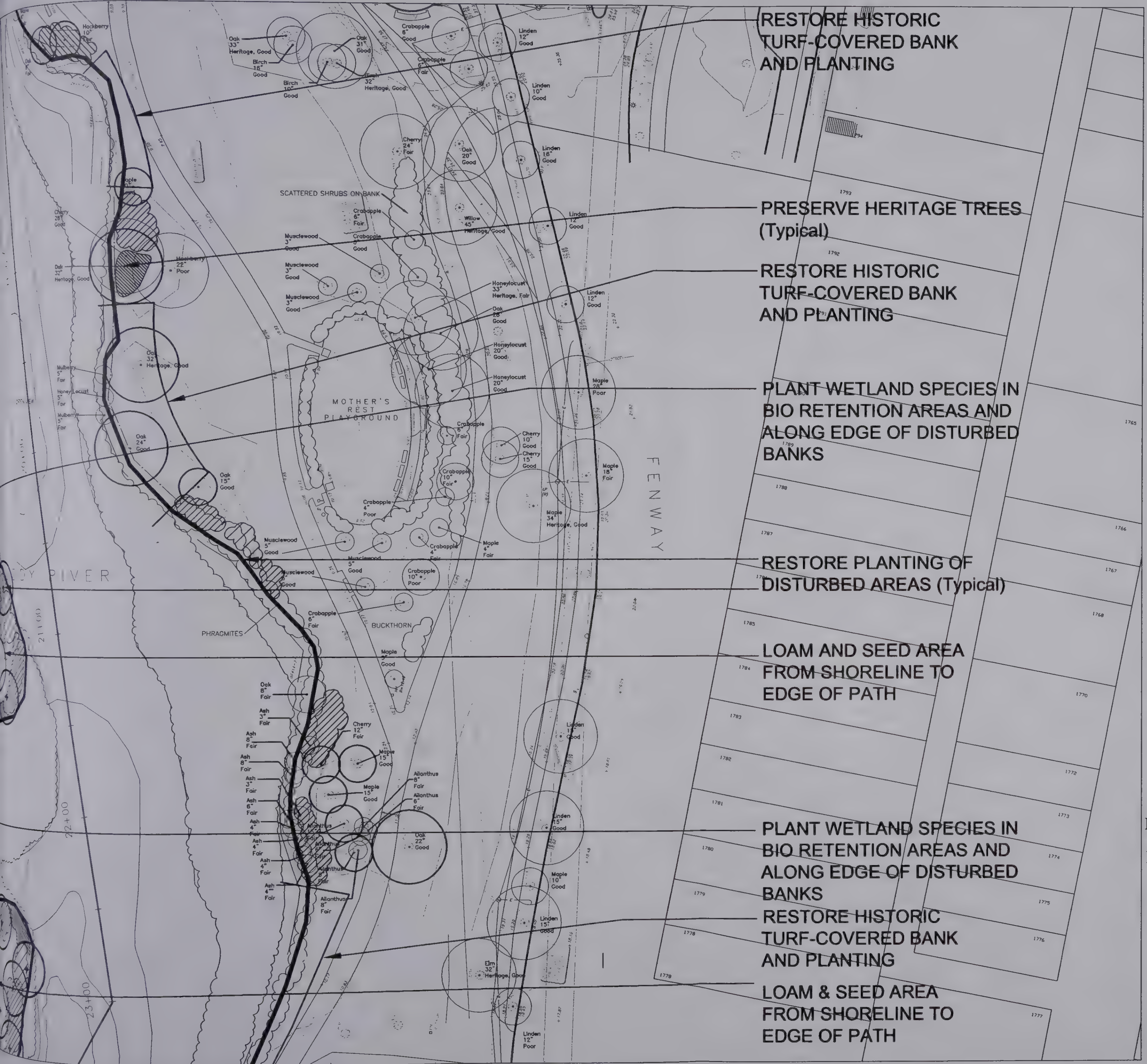
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L5



RESTORE HISTORIC TURF-COVERED BANK AND PLANTING

PRESERVE HERITAGE TREES (Typical)

RESTORE HISTORIC TURF-COVERED BANK AND PLANTING

PLANT WETLAND SPECIES IN BIO RETENTION AREAS AND ALONG EDGE OF DISTURBED BANKS

RESTORE PLANTING OF DISTURBED AREAS (Typical)

LOAM AND SEED AREA FROM SHORELINE TO EDGE OF PATH

PLANT WETLAND SPECIES IN BIO RETENTION AREAS AND ALONG EDGE OF DISTURBED BANKS

RESTORE HISTORIC TURF-COVERED BANK AND PLANTING

LOAM & SEED AREA FROM SHORELINE TO EDGE OF PATH

LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	╌
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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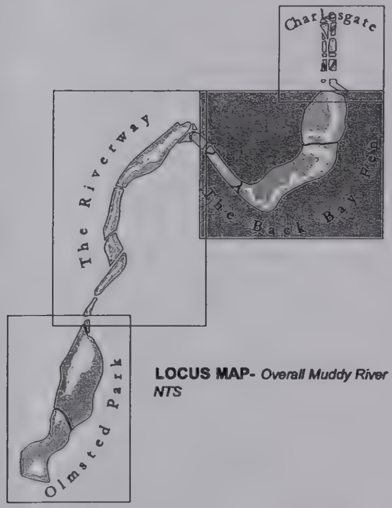
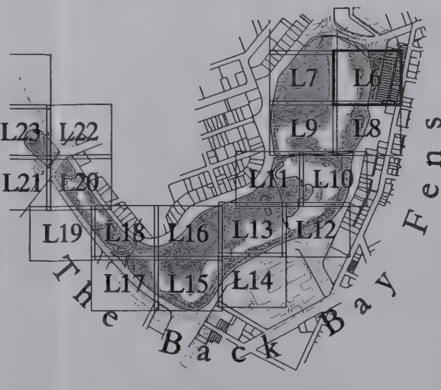


LOCUS MAP- *Overall Muddy River NTS*



LOCUS MAP- *Back Bay Fens NTS*

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

GRAPHIC SCALE
20 0 20 40

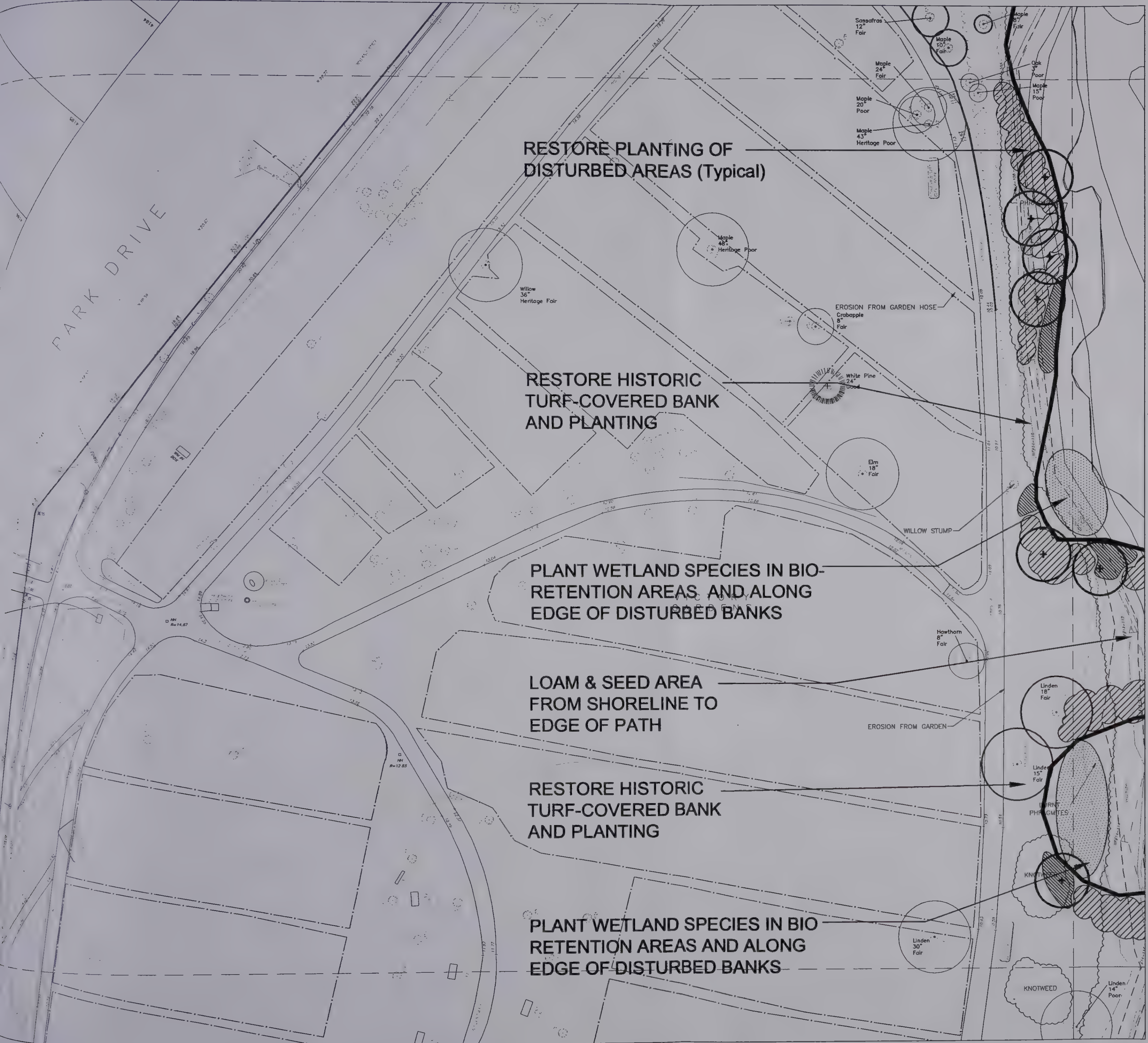
SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY: MP
DATE: 12/15/00
SCALE 1"=60'

DRAWING NO.

L6



LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	‐ ‐ ‐
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

1) All disturbed areas remaining after implementation of planting to be loamed and re-seeded (except where noted on drawings).
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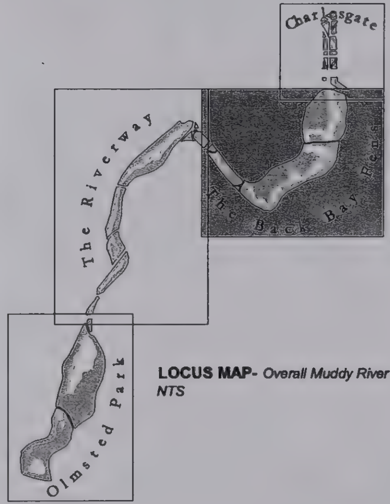
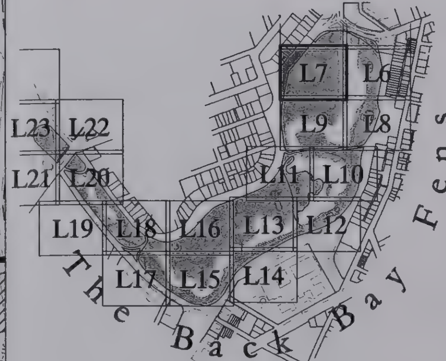


LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *Back Bay Fens*
NTS

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO.	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

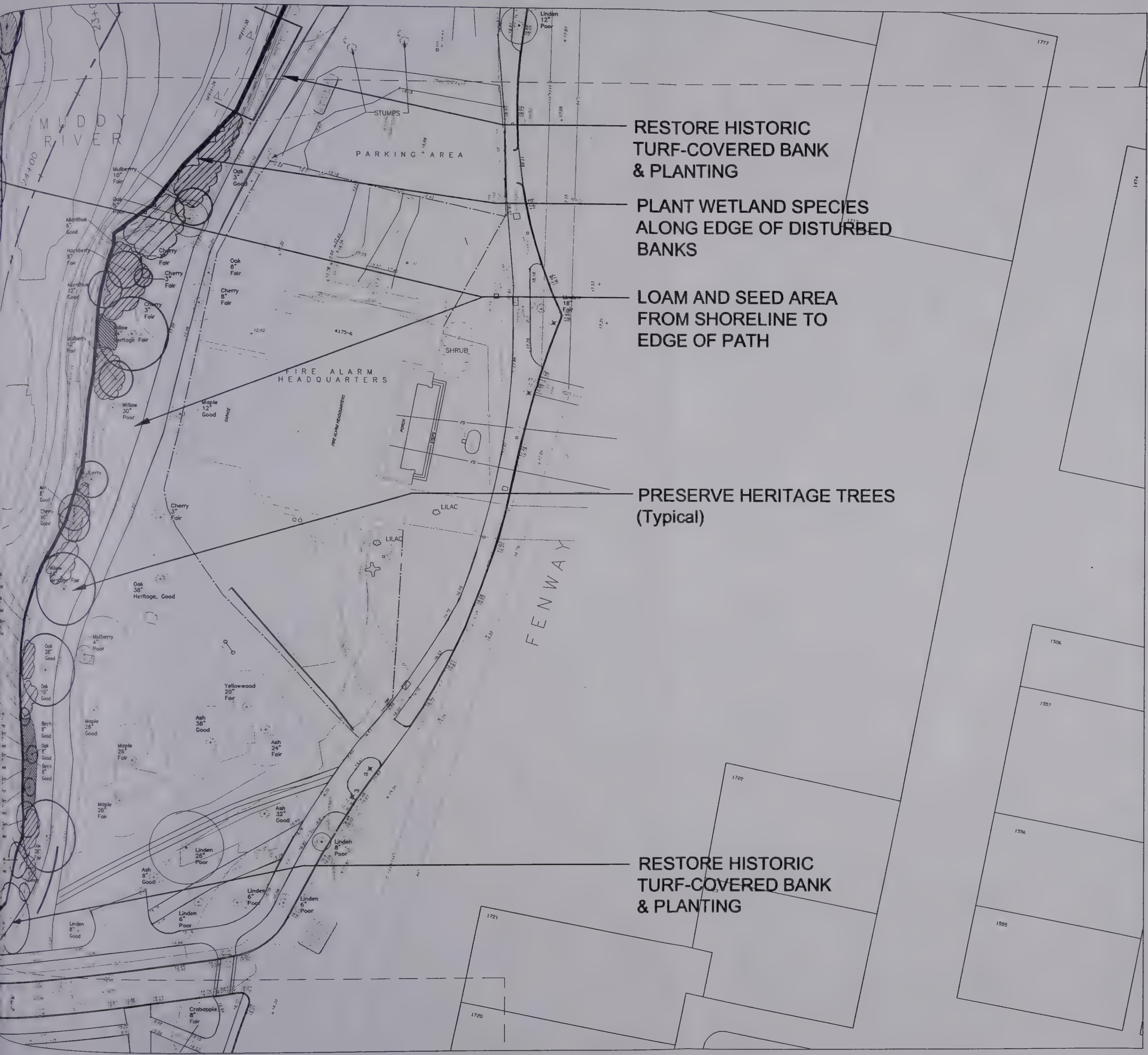
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L7



RESTORE HISTORIC TURF-COVERED BANK & PLANTING

PLANT WETLAND SPECIES ALONG EDGE OF DISTURBED BANKS

LOAM AND SEED AREA FROM SHORELINE TO EDGE OF PATH

PRESERVE HERITAGE TREES (Typical)

RESTORE HISTORIC TURF-COVERED BANK & PLANTING

LEGEND

PROPOSED SHORELINE LOCATION	∼
EXISTING SHORELINE TO BE RETAINED	╌
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▩
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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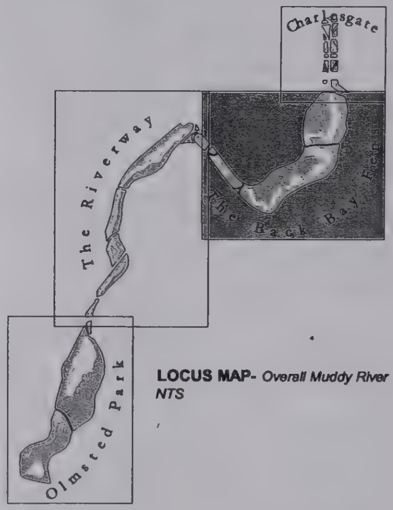
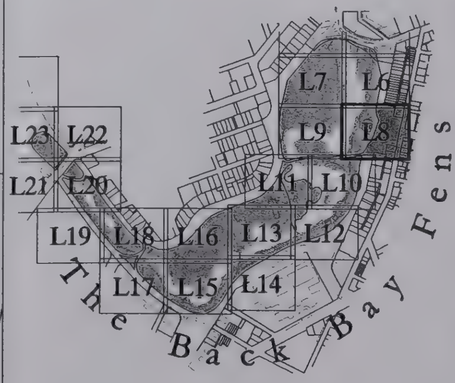


LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *Back Bay Fens*
NTS

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Boston and Brookline, Massachusetts

REVISIONS

NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

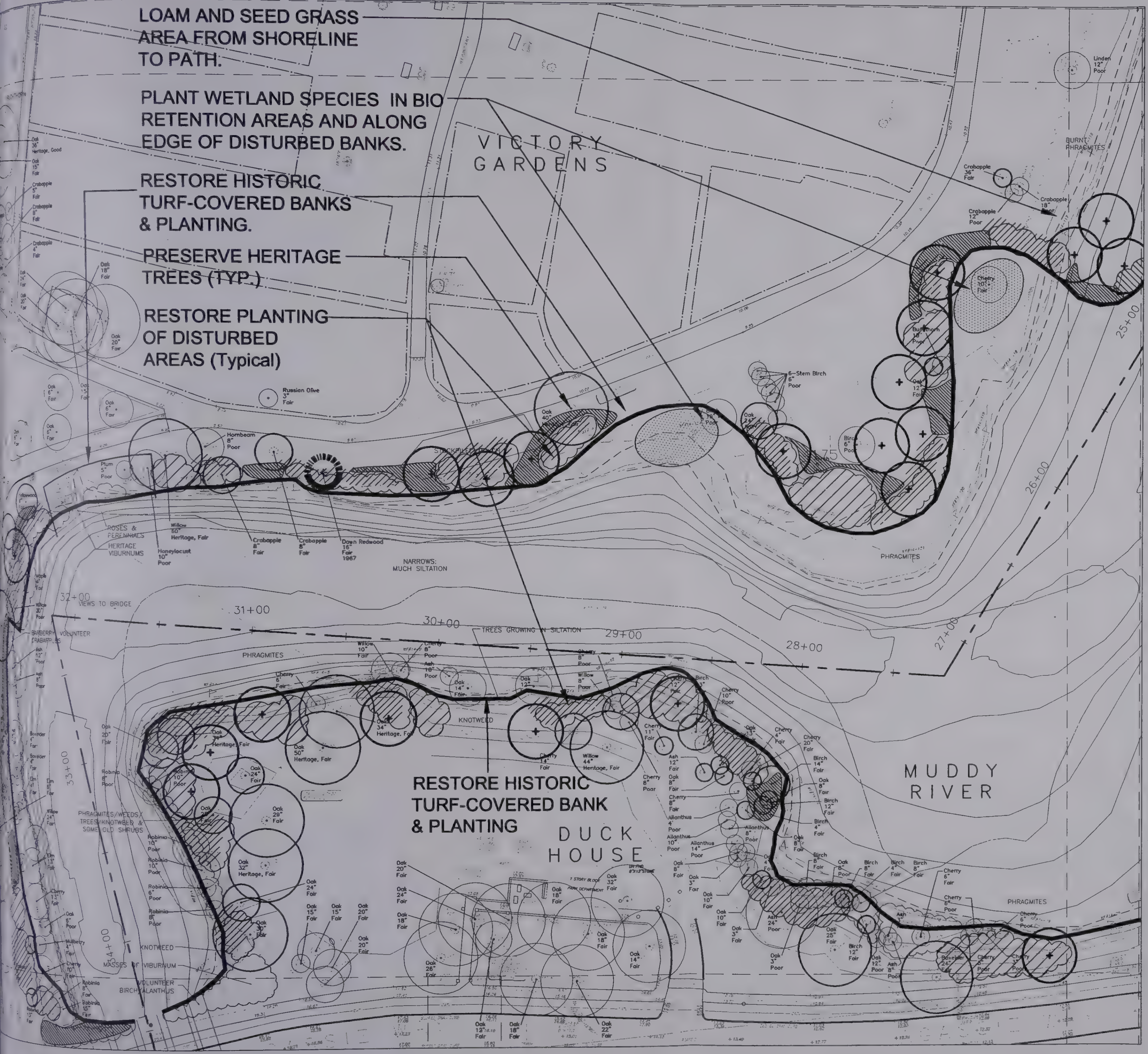
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY: MF
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L8



LOAM AND SEED GRASS AREA FROM SHORELINE TO PATH.

PLANT WETLAND SPECIES IN BIO RETENTION AREAS AND ALONG EDGE OF DISTURBED BANKS.

RESTORE HISTORIC TURF-COVERED BANKS & PLANTING.

PRESERVE HERITAGE TREES (TYP.)

RESTORE PLANTING OF DISTURBED AREAS (Typical)

RESTORE HISTORIC TURF-COVERED BANK & PLANTING

LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	~
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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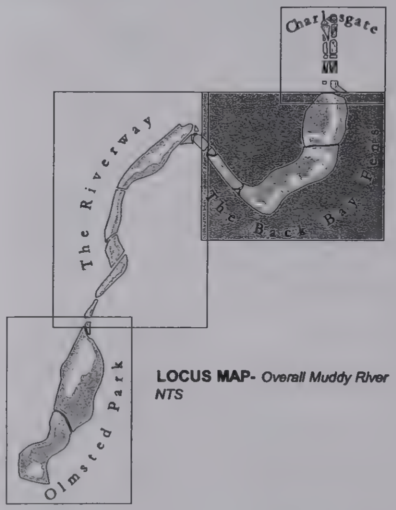

LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *Back Bay Fens*
NTS

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS		
NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

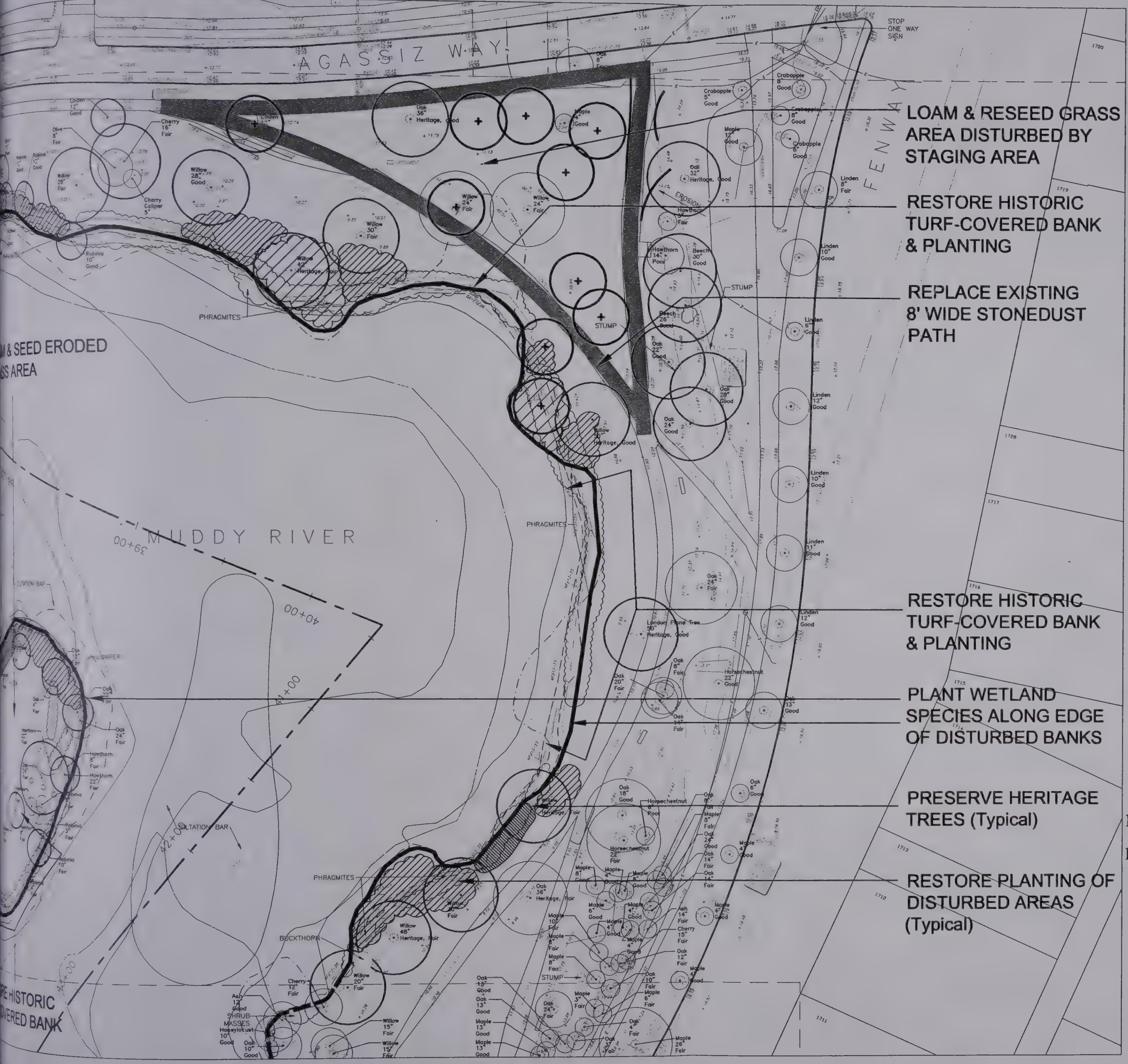
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY: MP
DATE: 11/21/00
SCALE: 1"=40'

DRAWING NO
L9



LEGEND

PROPOSED SHORELINE LOCATION	～
EXISTING SHORELINE TO BE RETAINED	‐ ‐ ‐
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▧
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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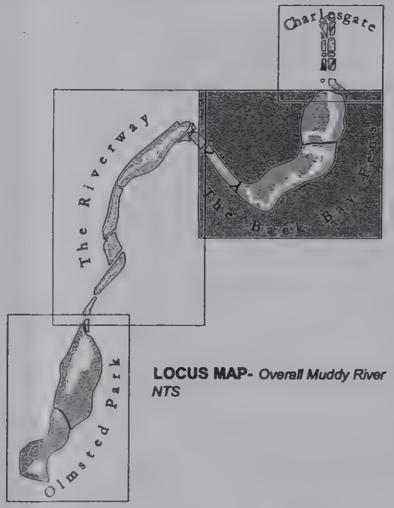
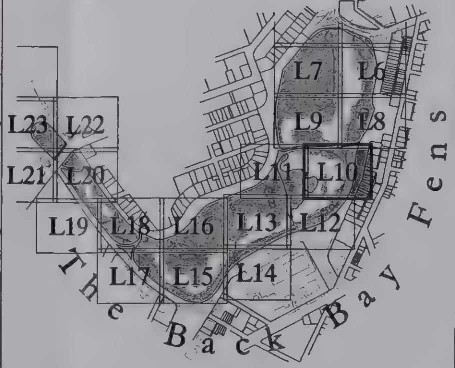


LOCUS MAP- *Overall Muddy River NTS*



LOCUS MAP- *Back Bay Fens NTS*

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO.	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

GRAPHIC SCALE

20 0 20 40

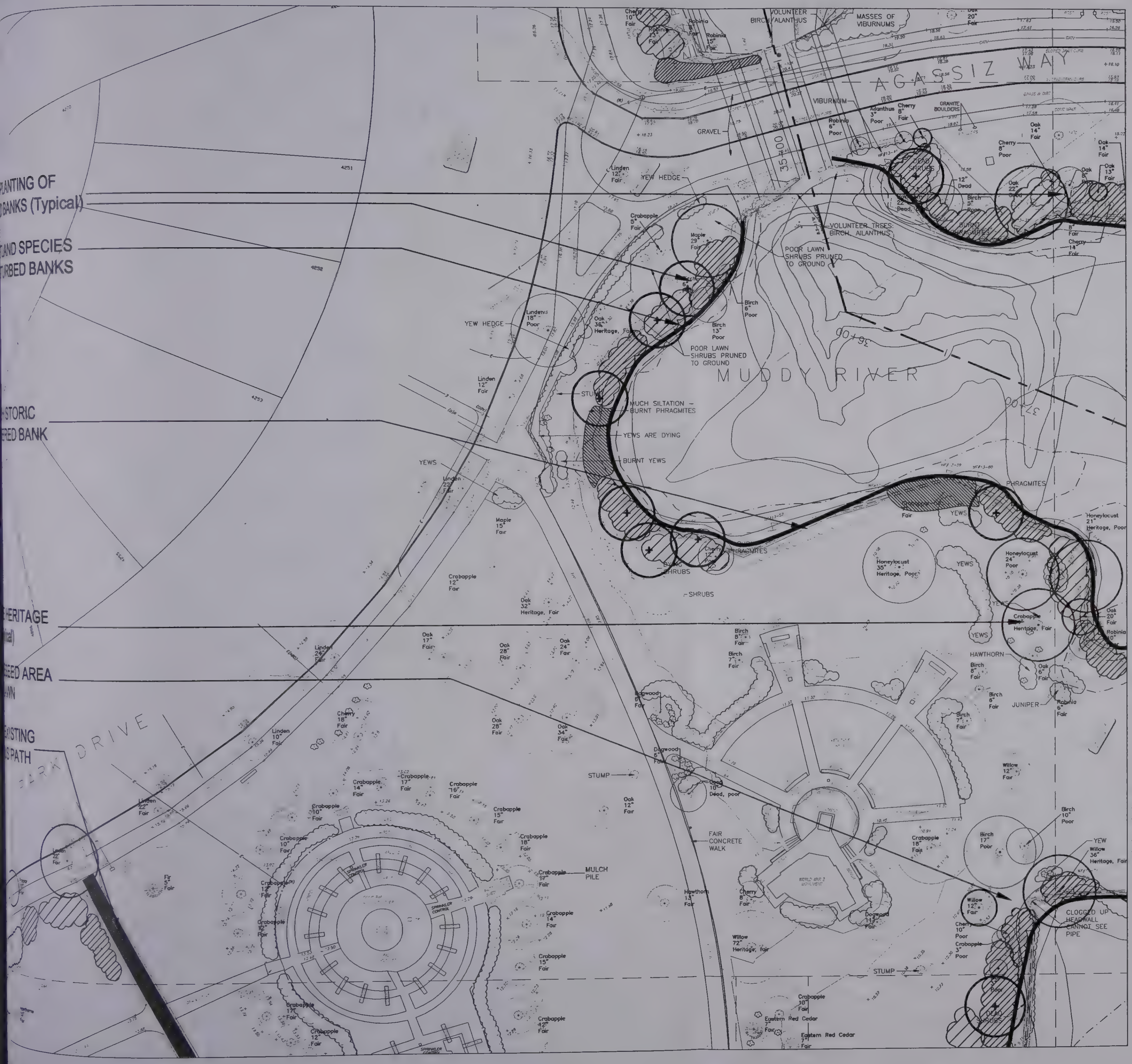
SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY: MP
DATE. 12/15/00
SCALE. 1"=60'

DRAWING NO.

L10



LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	- - -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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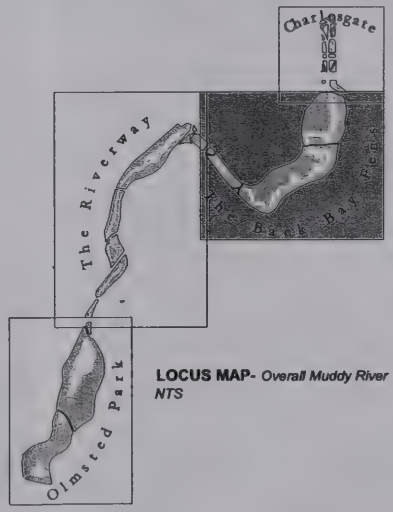

LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *Back Bay Fens*
NTS

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Boston and Brookline, Massachusetts

REVISIONS		
NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY
DESIGN

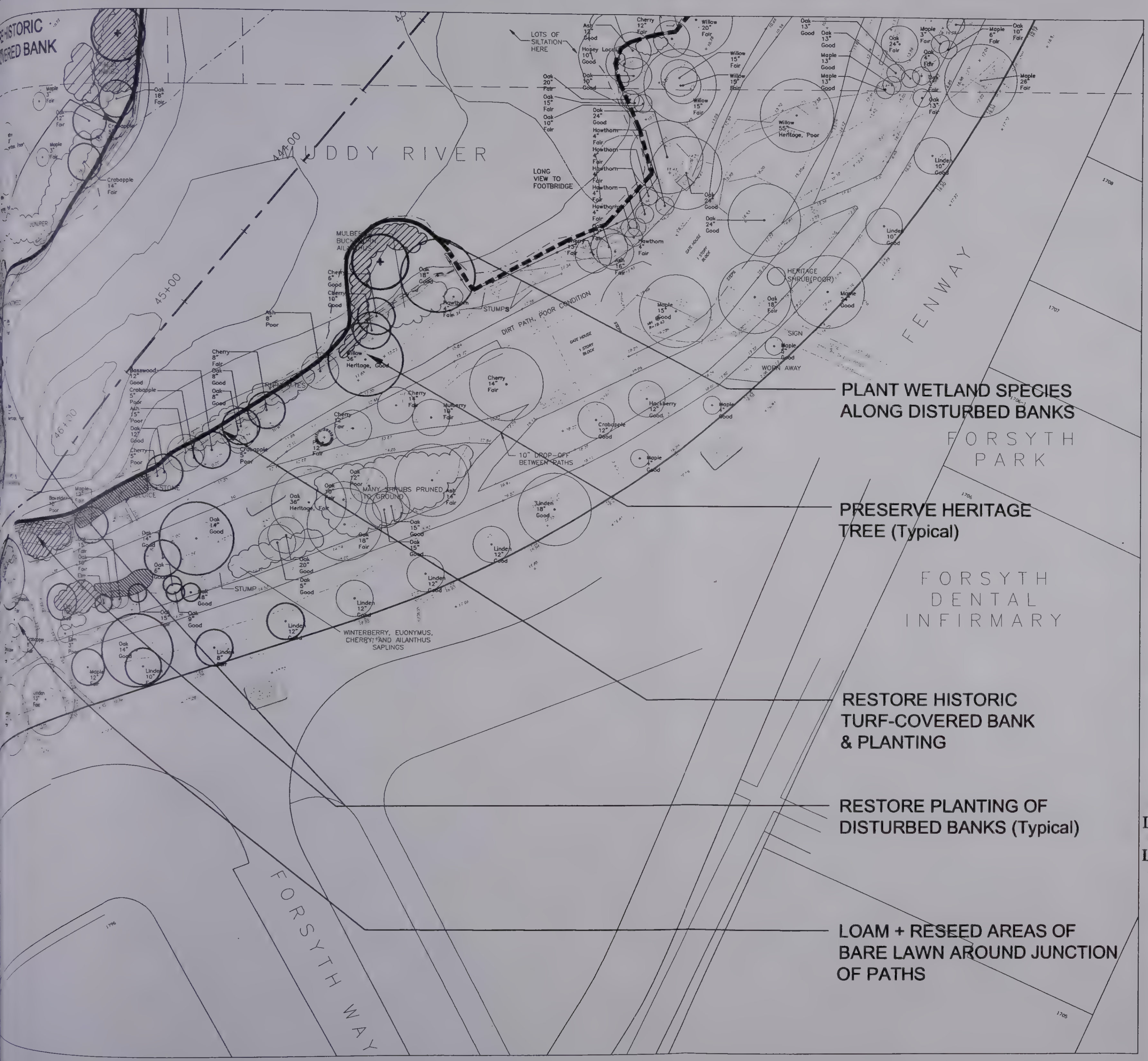
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY: MP
DATE: 15/12/00
SCALE: 1"=60'

DRAWING NO.
L11



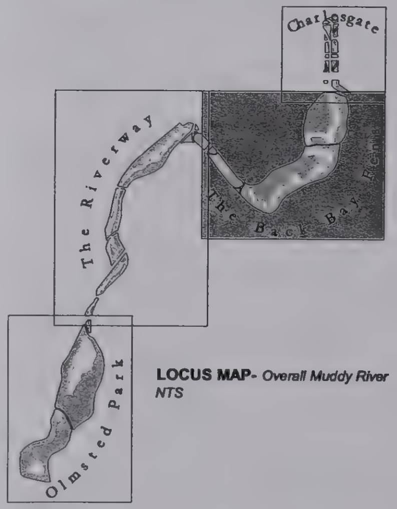
HISTORIC
VERED BANK
MUDDY RIVER
45+00
46+00
44+00
LOTS OF SILTATION HERE
LONG VIEW TO FOOTBRIDGE
HERITAGE SHRUB(POOR)
Willow 55" Heritage, Poor
Willow 36" Heritage, Good
Oak 36" Heritage, Fair
STUMPS
STUMP
DIRT PATH, POOR CONDITION
GATE HOUSE
SIGN
WORN AWAY
10" DROP-OFF BETWEEN PATHS
MANY SHRUBS PRUNED TO GROUND
WINTERBERRY, EUONYMUS, CHERRY, AND AILANTHUS SAPLINGS
FENWAY
FORSYTH PARK
FORSYTH DENTAL INFIRMARY
FORSYTH WAY
PLANT WETLAND SPECIES ALONG DISTURBED BANKS
PRESERVE HERITAGE TREE (Typical)
RESTORE HISTORIC TURF-COVERED BANK & PLANTING
RESTORE PLANTING OF DISTURBED BANKS (Typical)
LOAM + RESEED AREAS OF BARE LAWN AROUND JUNCTION OF PATHS
1705
1706
1707
1708

LEGEND

- PROPOSED SHORELINE LOCATION ~
- EXISTING SHORELINE TO BE RETAINED - -
- EXISTING TREES TO BE RETAINED ⊙
- PROPOSED TREE PLANTING ⊕
- PERENNIAL PLANTING ▦
- LOW SHRUB PLANTING ▨
- MEDIUM SHRUB PLANTING ▨
- HIGH SHRUB PLANTING ▨
- NEW OR REPLACEMENT PATHS ■

NOTES

1) All disturbed areas remaining after implementation of planting to be loamed and re-seeded (except where noted on drawings).
2) Appropriate wetland species to be planted along length of disturbed banks, to a width of 2'-0" (except where noted on drawings).



LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *Back Bay Fens*
NTS

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

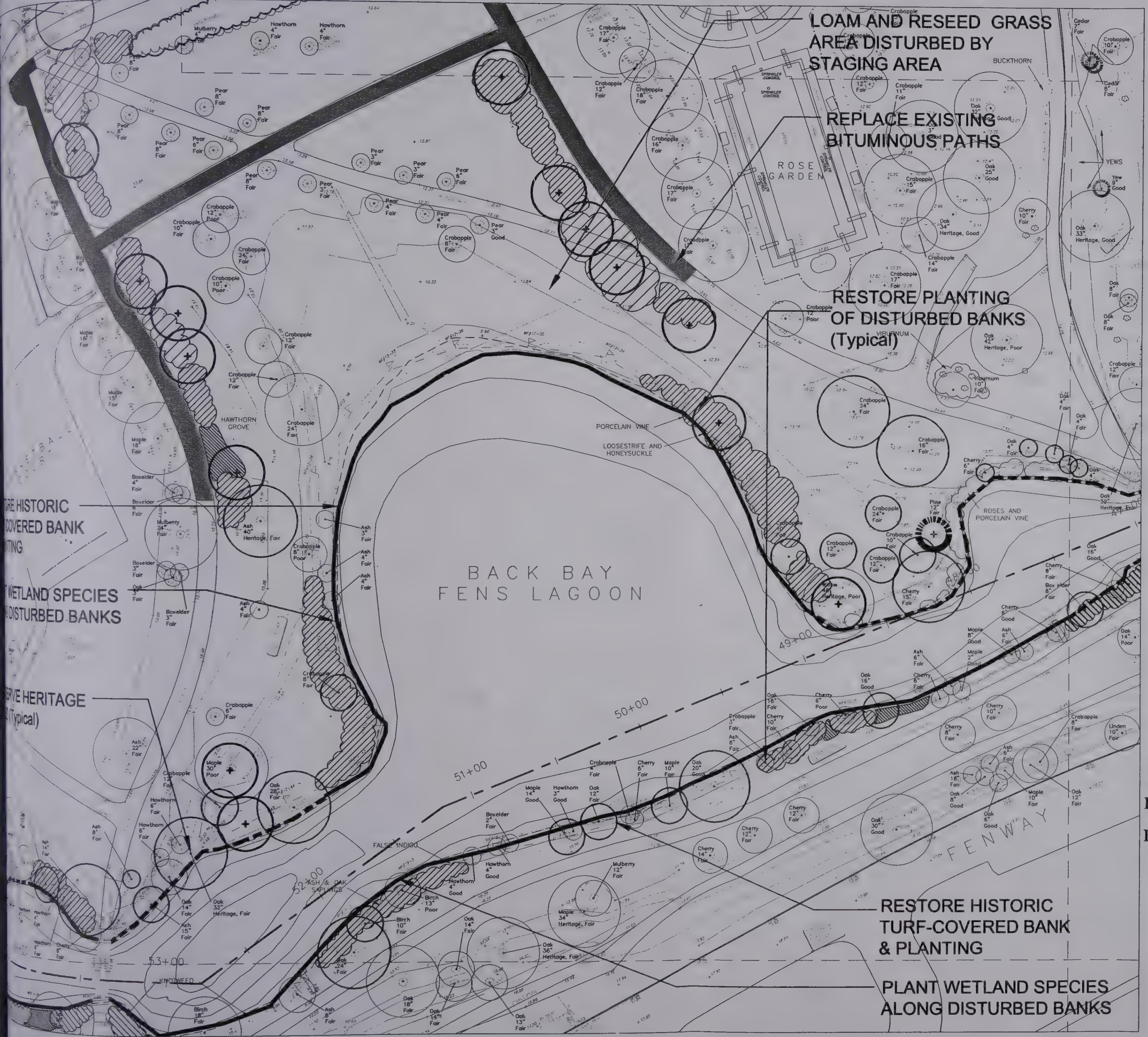
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY: MP
DATE 12/15/00
SCALE: 1"=60'

DRAWING NO
L12



LEGEND

PROPOSED SHORELINE LOCATION	〜
EXISTING SHORELINE TO BE RETAINED	- - -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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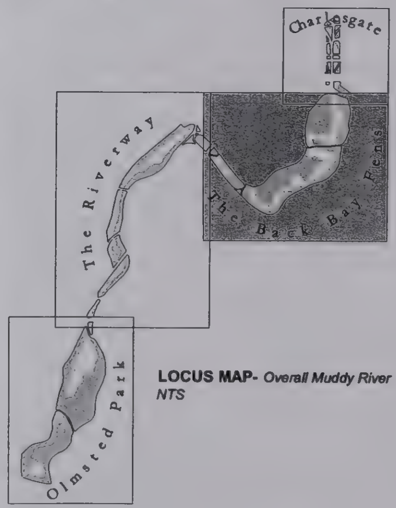
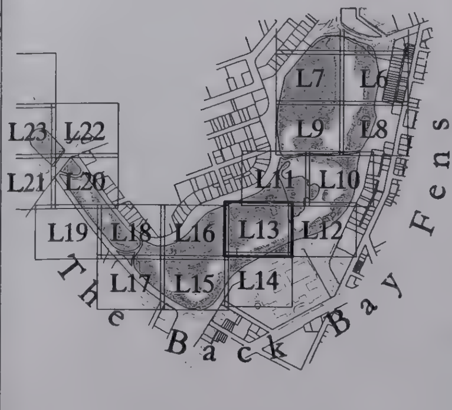


LOCUS MAP- *Overall Muddy River NTS*



LOCUS MAP- *Back Bay Fens NTS*

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

GRAPHIC SCALE

20 0 20 40

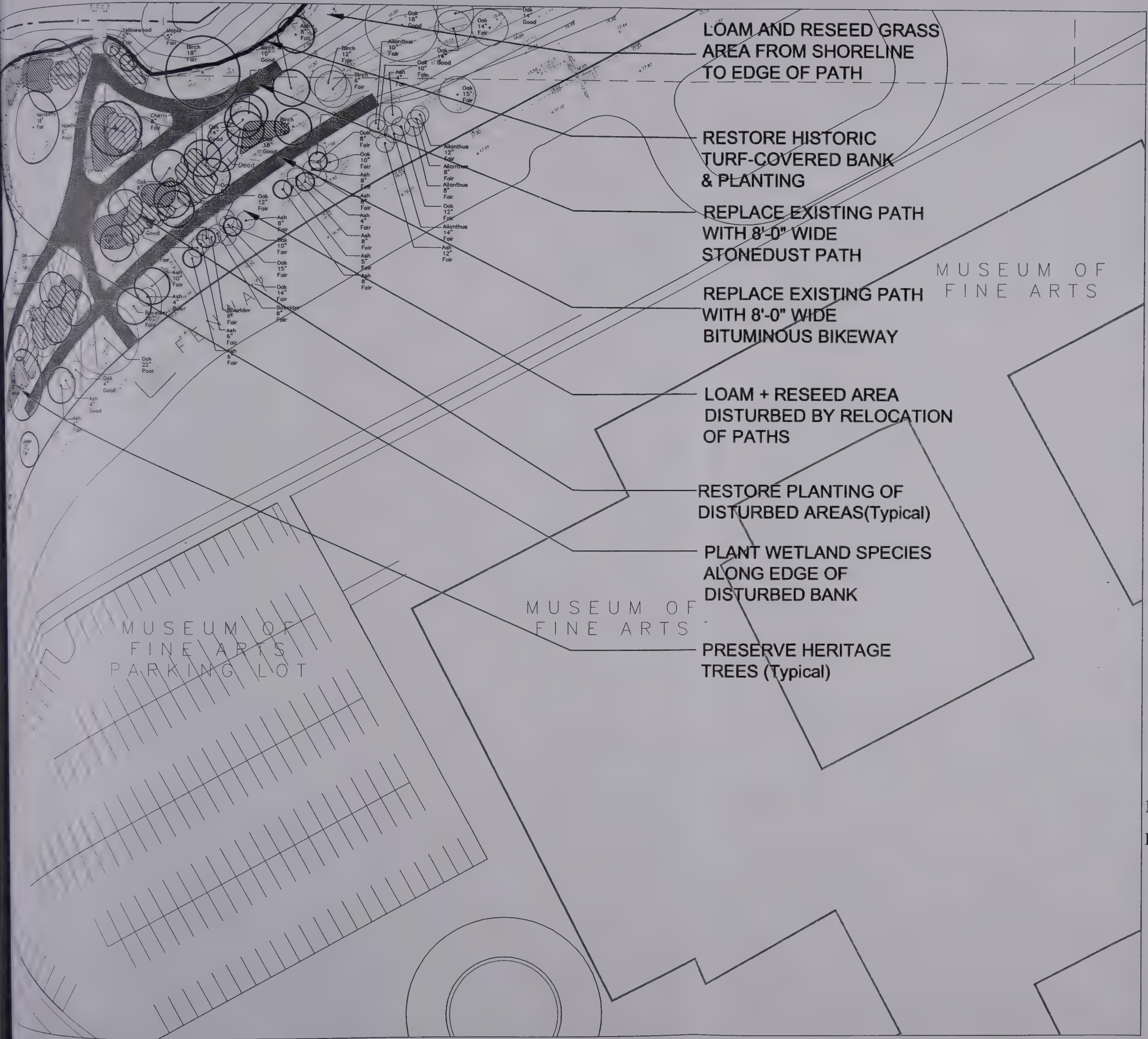
SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.

L13


LOAM AND RESEED GRASS AREA FROM SHORELINE TO EDGE OF PATH
RESTORE HISTORIC TURF-COVERED BANK & PLANTING
REPLACE EXISTING PATH WITH 8'-0" WIDE STONEDUST PATH
REPLACE EXISTING PATH WITH 8'-0" WIDE BITUMINOUS BIKEWAY
LOAM + RESEED AREA DISTURBED BY RELOCATION OF PATHS
RESTORE PLANTING OF DISTURBED AREAS(Typical)
PLANT WETLAND SPECIES ALONG EDGE OF DISTURBED BANK
PRESERVE HERITAGE TREES (Typical)
MUSEUM OF FINE ARTS
MUSEUM OF FINE ARTS
MUSEUM OF FINE ARTS PARKING LOT
FENWAY

LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	- -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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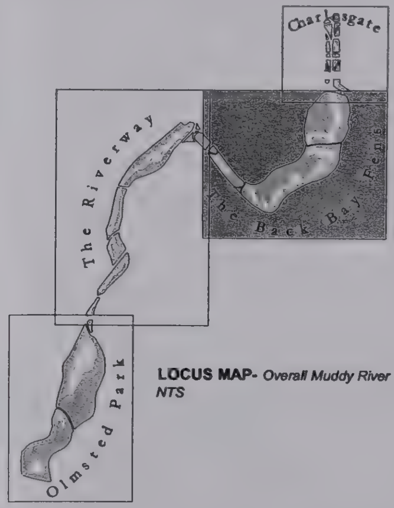

LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *Back Bay Fens*
NTS

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

GRAPHIC SCALE
20 0 20 40

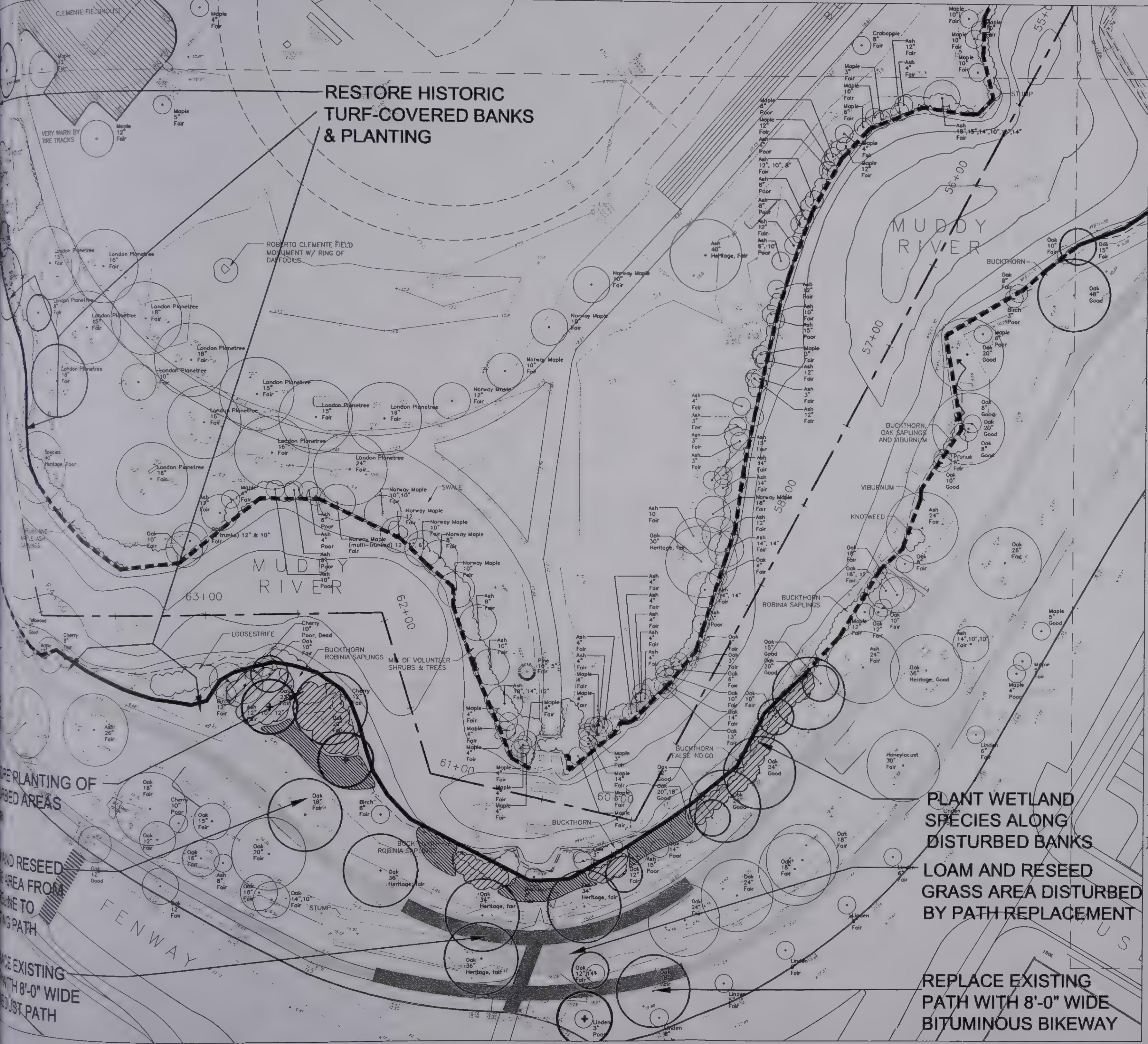
SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.

L14



LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	- - -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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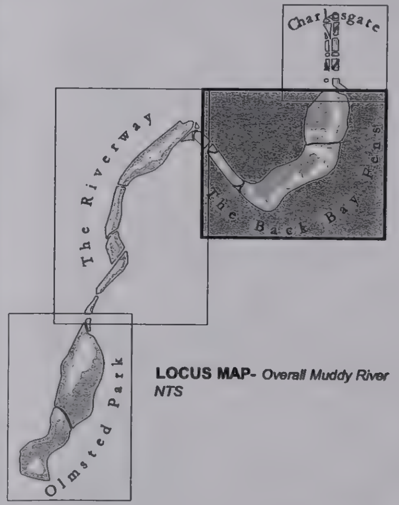

LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *Back Bay Fens*
NTS

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO.	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

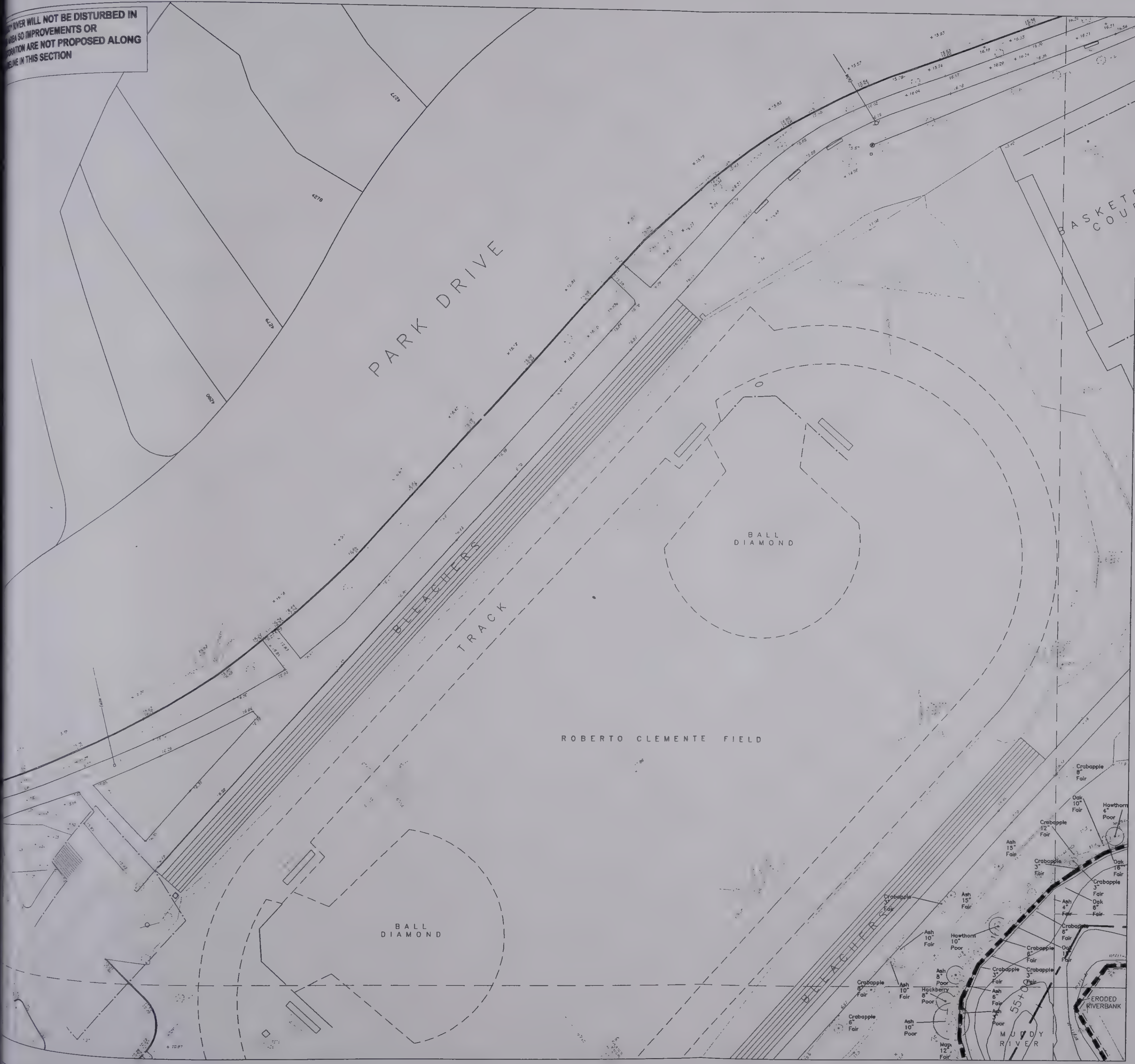
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: SF/MC
CHECKED BY: MP
DATE: 12/15/00
SCALE 1"=60'

DRAWING NO.
L15



LEGEND

PROPOSED SHORELINE LOCATION	∼
EXISTING SHORELINE TO BE RETAINED	- -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▧
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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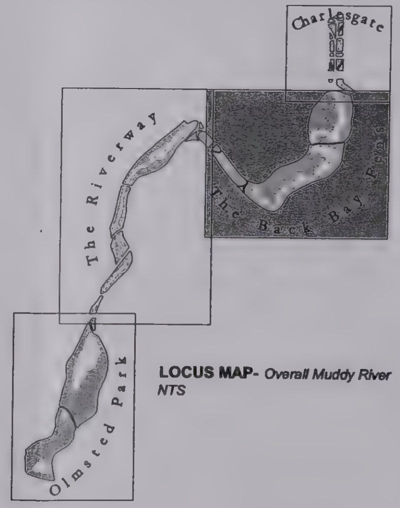
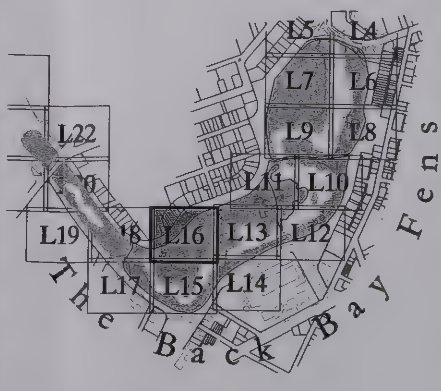


LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *The Riverway Area*
NTS

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

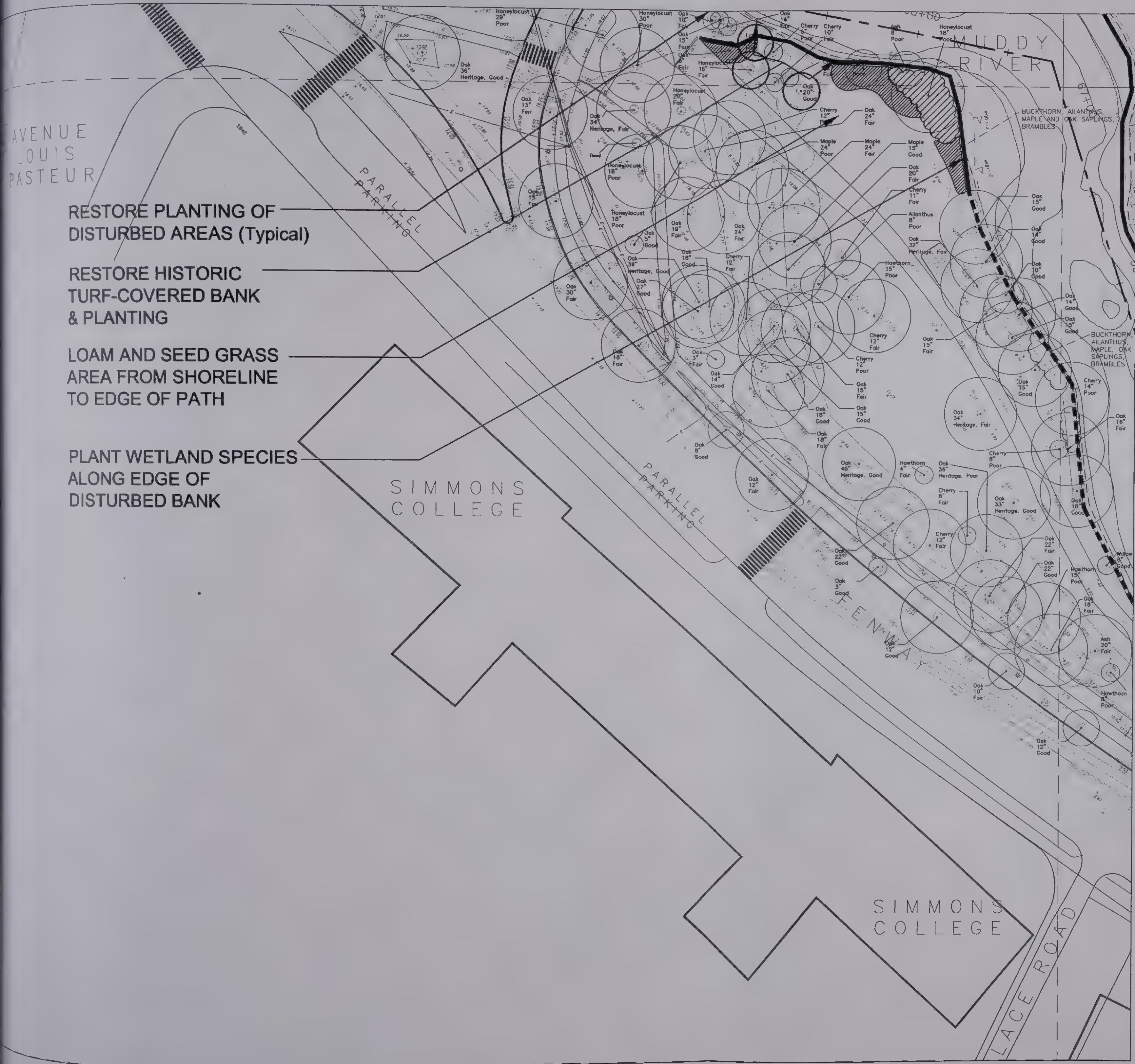
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: SF/MC
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L16



RESTORE PLANTING OF DISTURBED AREAS (Typical)

RESTORE HISTORIC TURF-COVERED BANK & PLANTING

LOAM AND SEED GRASS AREA FROM SHORELINE TO EDGE OF PATH

PLANT WETLAND SPECIES ALONG EDGE OF DISTURBED BANK

LEGEND

PROPOSED SHORELINE LOCATION	～
EXISTING SHORELINE TO BE RETAINED	- -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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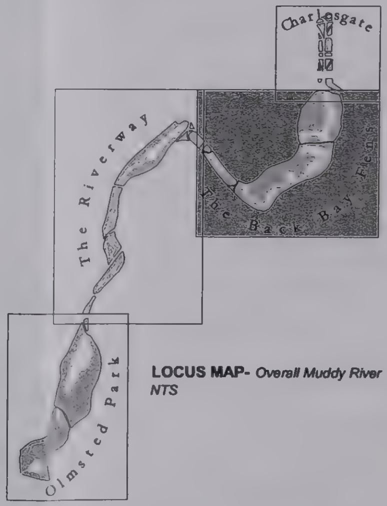
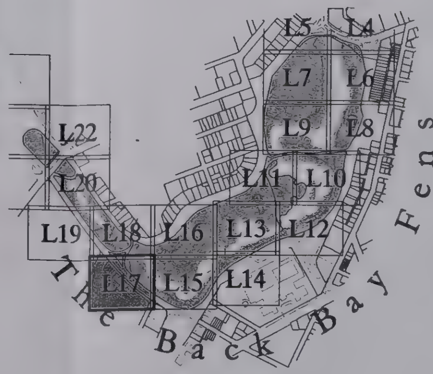


LOCUS MAP- *Overall Muddy River NTS*



LOCUS MAP- *The Riverway Area NTS*

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS		
NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

GRAPHIC SCALE 20 0 20 40

SEAL

NORTH

DRAWN BY SF/MC
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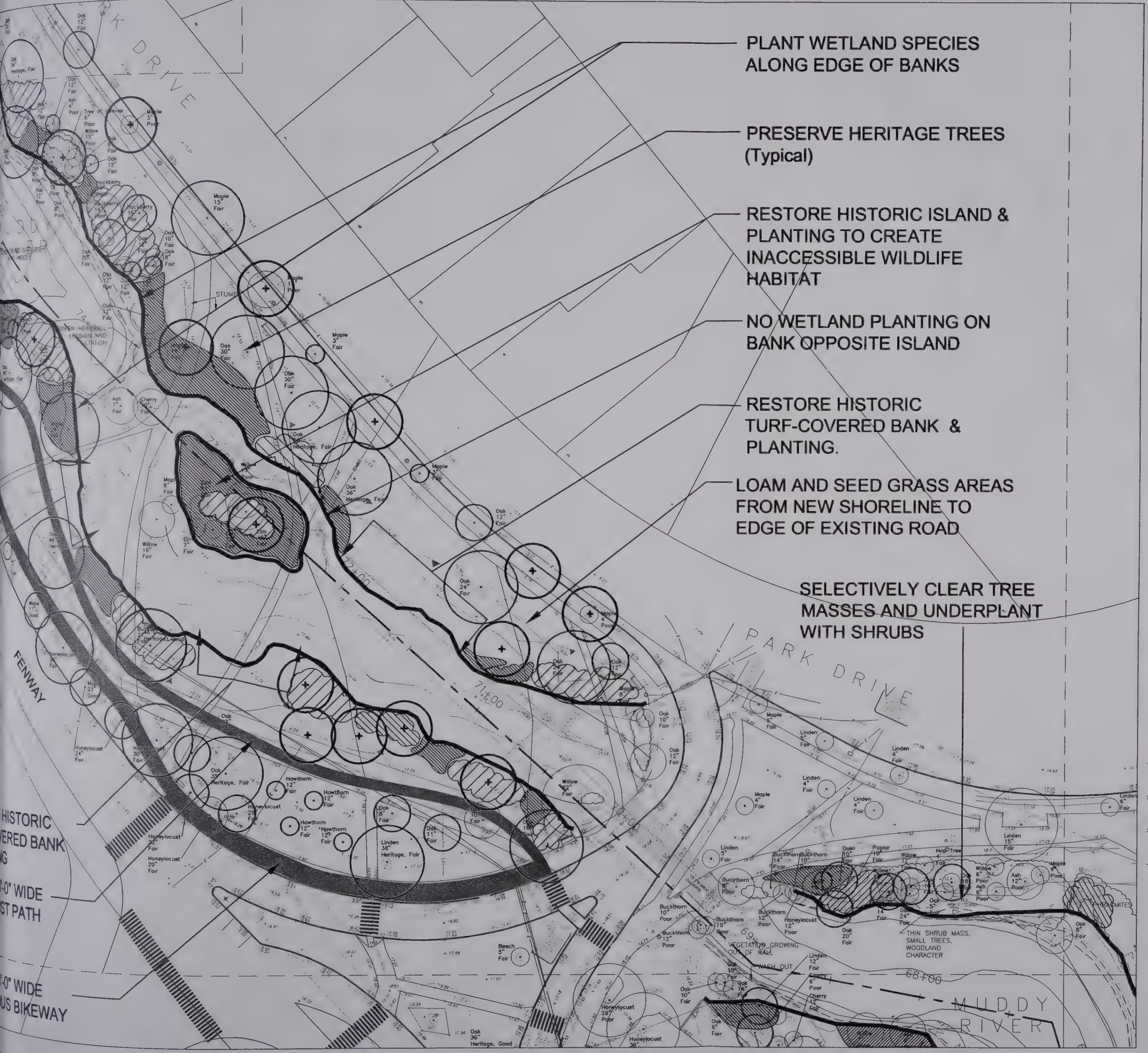
DATE 12/15/00
SCALE 1"=60'

DRAWING NO.

L17



PLANT WETLAND SPECIES ALONG EDGE OF BANKS

PRESERVE HERITAGE TREES (Typical)

RESTORE HISTORIC ISLAND & PLANTING TO CREATE INACCESSIBLE WILDLIFE HABITAT

NO WETLAND PLANTING ON BANK OPPOSITE ISLAND

RESTORE HISTORIC TURF-COVERED BANK & PLANTING.

LOAM AND SEED GRASS AREAS FROM NEW SHORELINE TO EDGE OF EXISTING ROAD

SELECTIVELY CLEAR TREE MASSES AND UNDERPLANT WITH SHRUBS

HISTORIC
VERED BANK
G

-0" WIDE
ST PATH

-0" WIDE
US BIKEWAY

LEGEND

PROPOSED SHORELINE LOCATION	〜
EXISTING SHORELINE TO BE RETAINED	‐ ‐ ‐
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▧
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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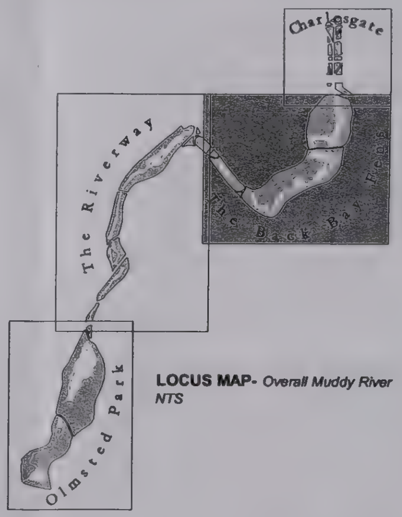
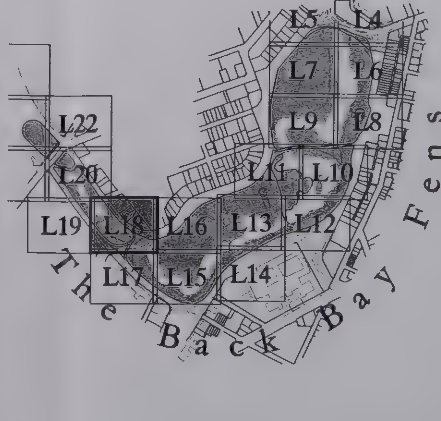


LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *The Riverway Area*
NTS

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO.	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: SF/MC
CHECKED BY: MP
DATE: 12/15/00
SCALE 1"=60'

DRAWING NO.
L18

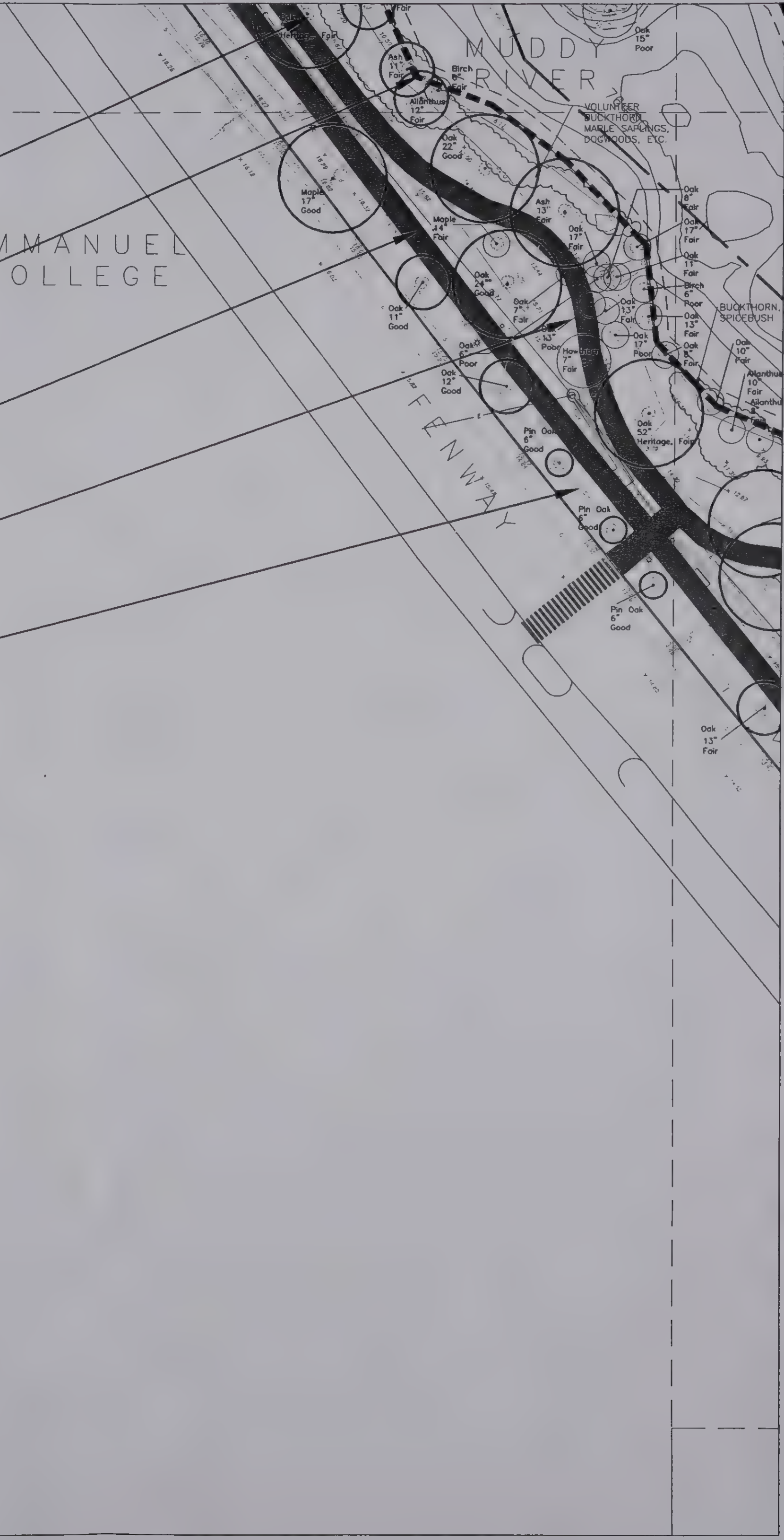
PRESERVE HERITAGE TREES (Typical)

NO WETLAND PLANTING ALONG UNDISTURBED BANK

INSTALL 8'-0" WIDE BITUMINOUS BIKEWAY

INSTALL 8'-0" WIDE STONEDUST PATH

LOAM AND SEED GRASS AREA FROM SHORELINE TO EDGE OF EXISTING ROAD



LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	- -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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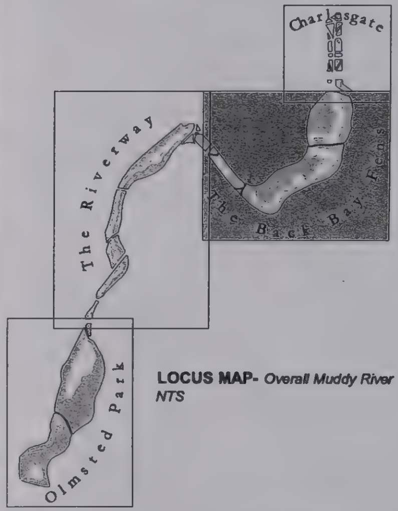
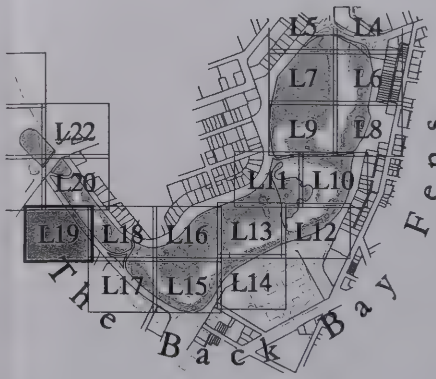


LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *The Riverway Area*
NTS

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY
DESIGN

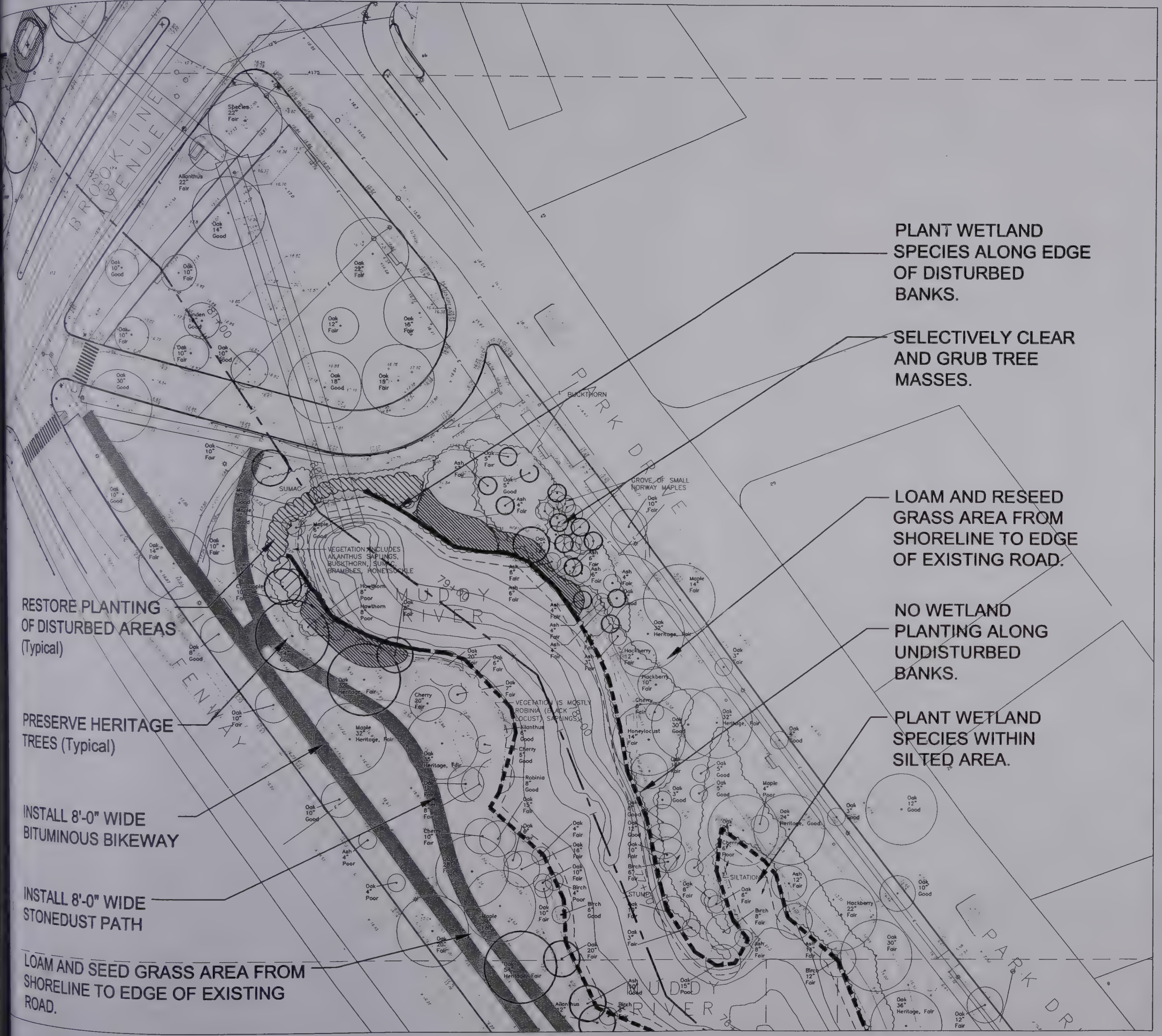
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: SF/MC
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L19



PLANT WETLAND SPECIES ALONG EDGE OF DISTURBED BANKS.

SELECTIVELY CLEAR AND GRUB TREE MASSES.

LOAM AND RESEED GRASS AREA FROM SHORELINE TO EDGE OF EXISTING ROAD.

NO WETLAND PLANTING ALONG UNDISTURBED BANKS.

PLANT WETLAND SPECIES WITHIN SILTED AREA.

RESTORE PLANTING OF DISTURBED AREAS (Typical)

PRESERVE HERITAGE TREES (Typical)

INSTALL 8'-0" WIDE BITUMINOUS BIKEWAY

INSTALL 8'-0" WIDE STONEDUST PATH

LOAM AND SEED GRASS AREA FROM SHORELINE TO EDGE OF EXISTING ROAD.

LEGEND

PROPOSED SHORELINE LOCATION	∼
EXISTING SHORELINE TO BE RETAINED	- - -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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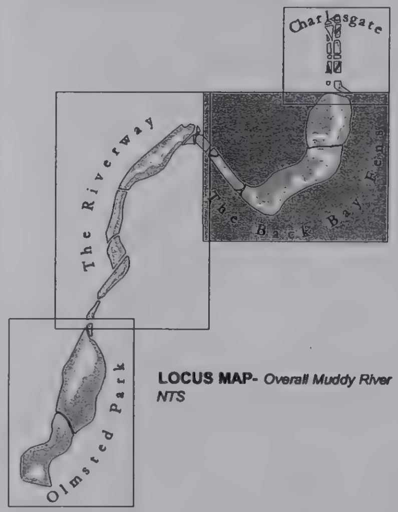

LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *The Riverway Area*
NTS

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REVISIONS

NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
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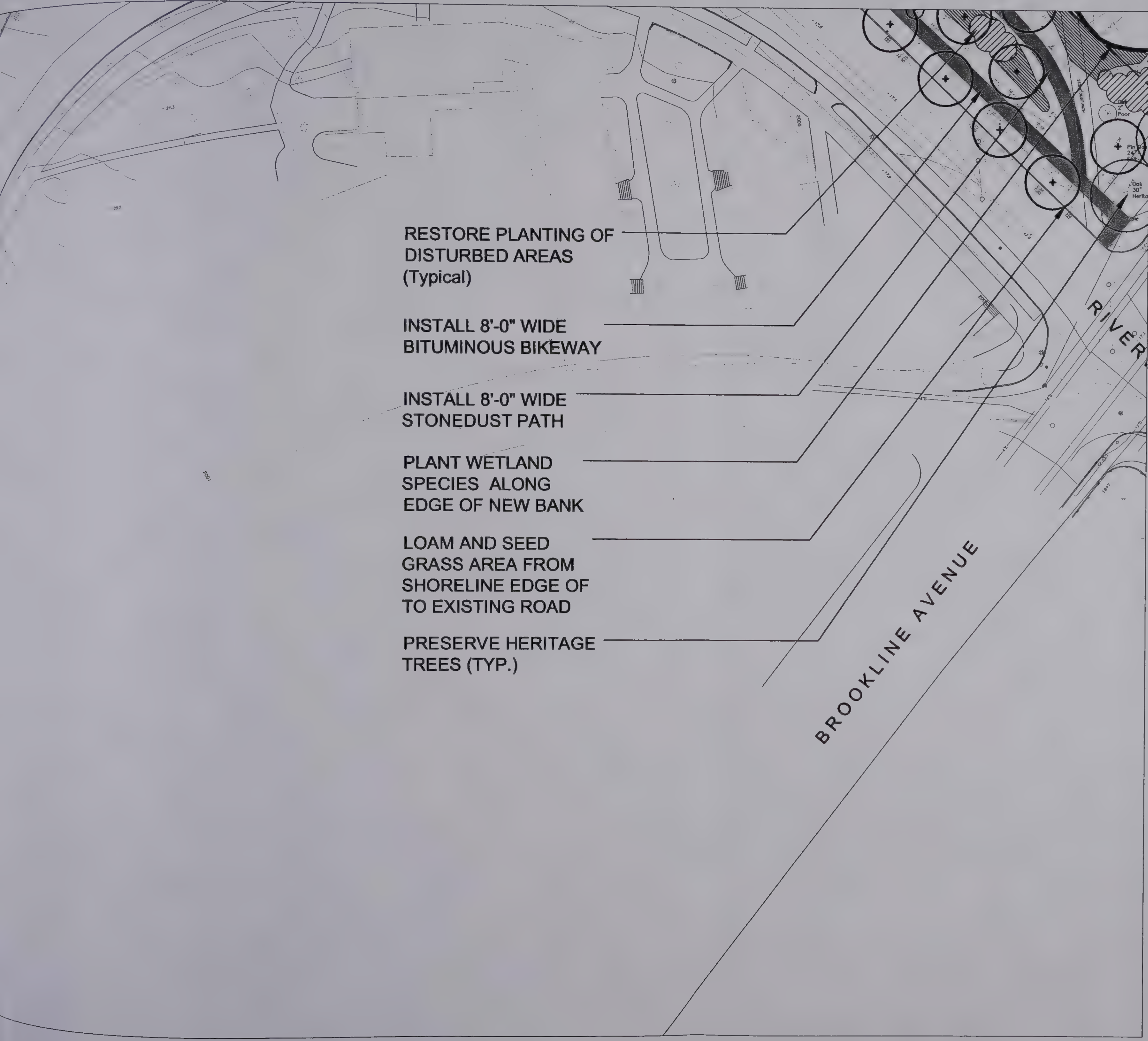
SCALE: 1"=60'

DRAWING NO.
L20



RESTORE PLANTING OF DISTURBED AREAS (Typical)

INSTALL 8'-0" WIDE BITUMINOUS BIKEWAY

INSTALL 8'-0" WIDE STONEDUST PATH

PLANT WETLAND SPECIES ALONG EDGE OF NEW BANK

LOAM AND SEED GRASS AREA FROM SHORELINE EDGE OF TO EXISTING ROAD

PRESERVE HERITAGE TREES (TYP.)

LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	╌
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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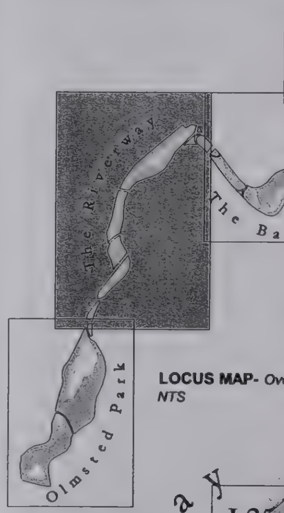
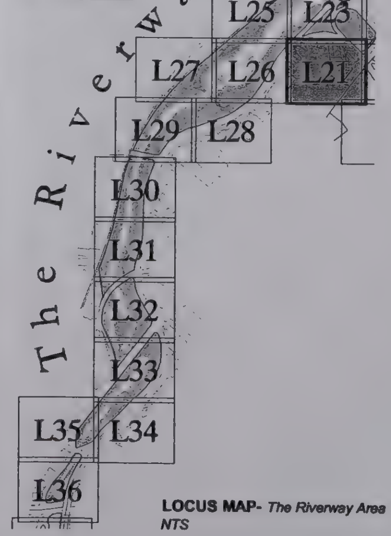


LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *The Riverway Area*
NTS

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

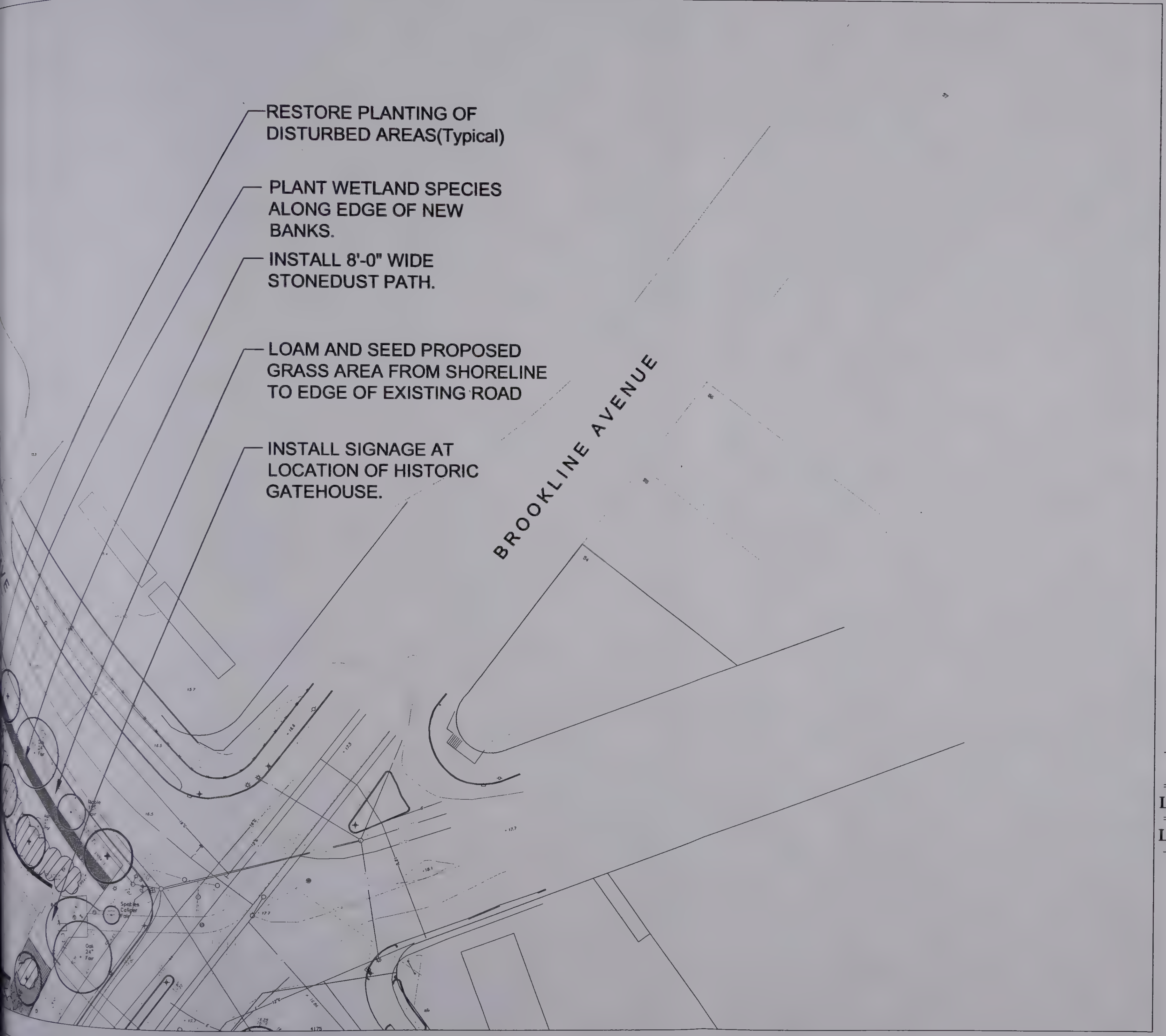
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY. MP
DATE: 12/15/00
SCALE. 1"=60'

DRAWING NO.
L21



RESTORE PLANTING OF DISTURBED AREAS(Typical)

PLANT WETLAND SPECIES ALONG EDGE OF NEW BANKS.

INSTALL 8'-0" WIDE STONEDUST PATH.

LOAM AND SEED PROPOSED GRASS AREA FROM SHORELINE TO EDGE OF EXISTING ROAD

INSTALL SIGNAGE AT LOCATION OF HISTORIC GATEHOUSE.

LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	- - -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▧
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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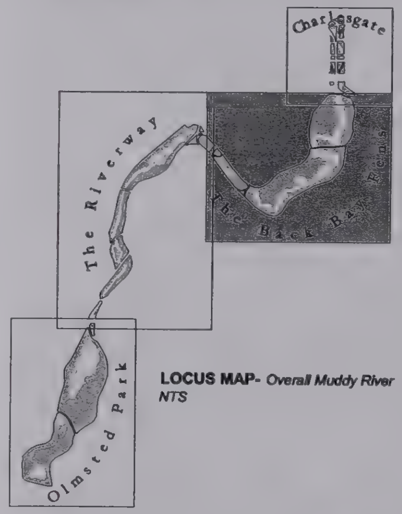
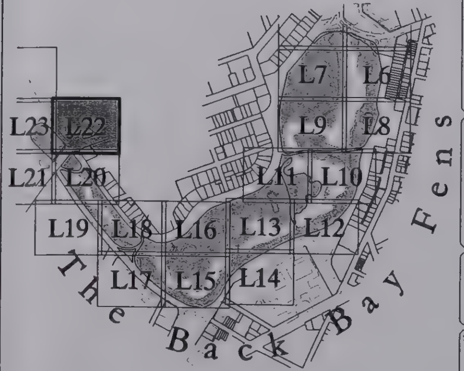


LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *Back Bay Fens*
NTS

Pressley
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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

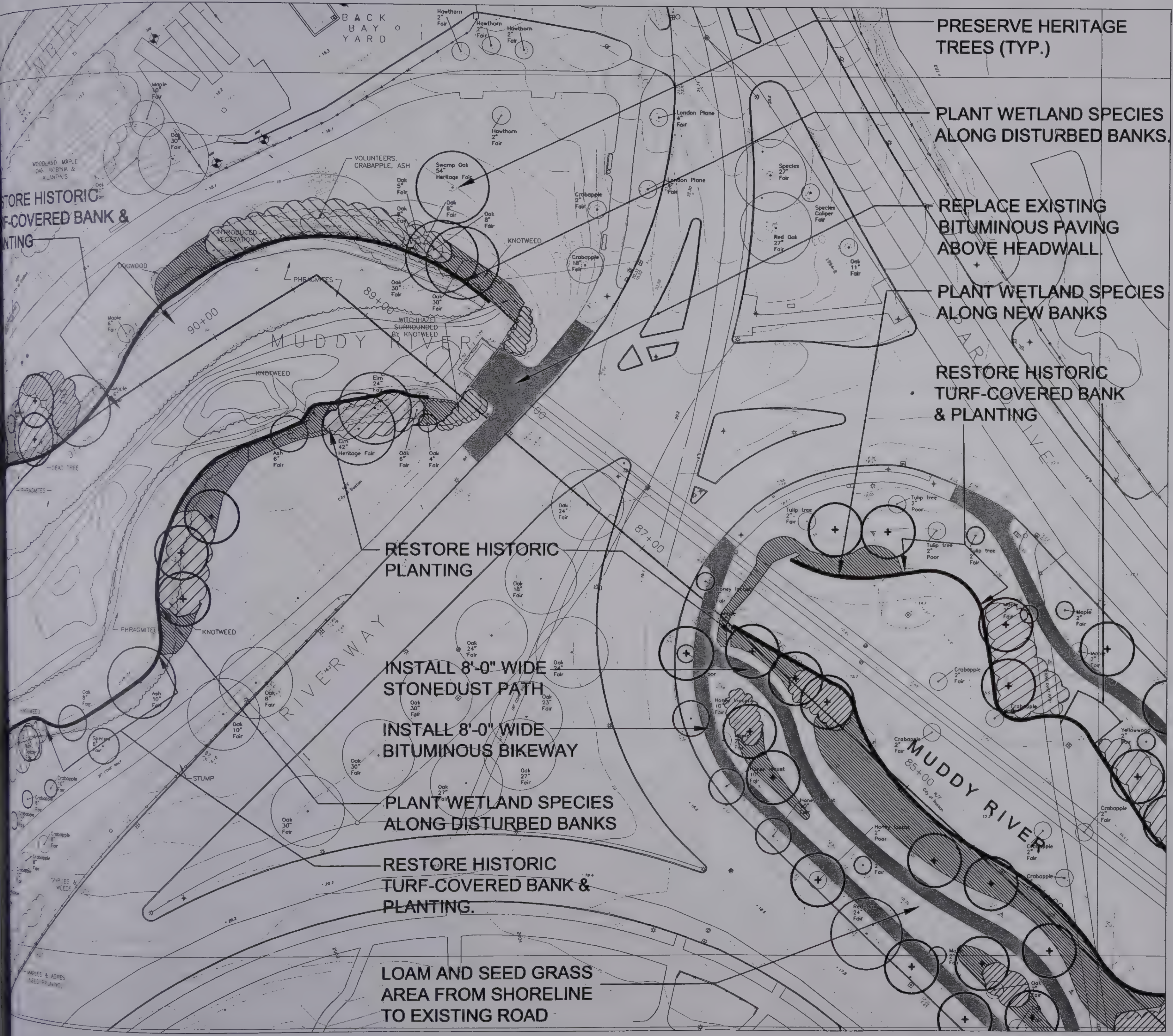
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY MC/SF
CHECKED BY MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L22



PRESERVE HERITAGE TREES (TYP.)

PLANT WETLAND SPECIES ALONG DISTURBED BANKS.

REPLACE EXISTING BITUMINOUS PAVING ABOVE HEADWALL.

PLANT WETLAND SPECIES ALONG NEW BANKS

RESTORE HISTORIC TURF-COVERED BANK & PLANTING

STORE HISTORIC F-COVERED BANK & NTING

RESTORE HISTORIC PLANTING

INSTALL 8'-0" WIDE STONEDUST PATH

INSTALL 8'-0" WIDE BITUMINOUS BIKEWAY

PLANT WETLAND SPECIES ALONG DISTURBED BANKS

RESTORE HISTORIC TURF-COVERED BANK & PLANTING.

LOAM AND SEED GRASS AREA FROM SHORELINE TO EXISTING ROAD

LEGEND

PROPOSED SHORELINE LOCATION	～
EXISTING SHORELINE TO BE RETAINED	- -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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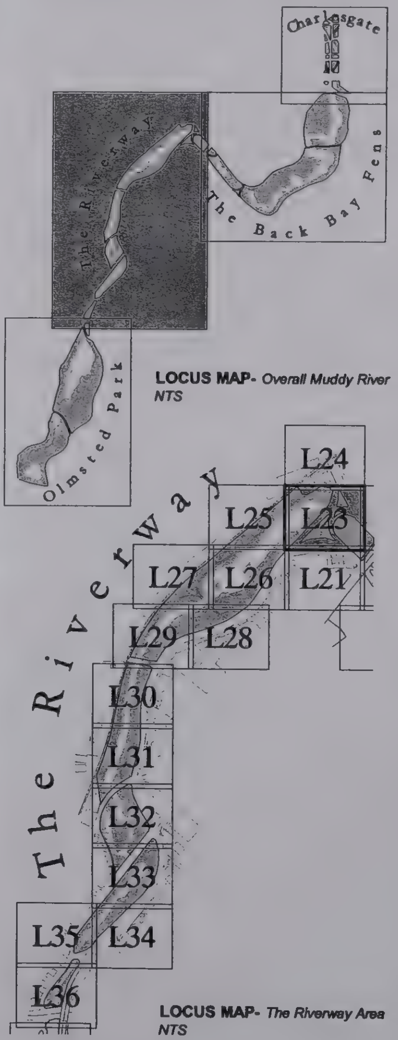
2) Appropriate wetland species to be planted along length of disturbed banks, to a width of 2'-0" (except where noted on drawings).



LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *The Riverway Area*
NTS

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20 0 20 40

SEAL

NORTH

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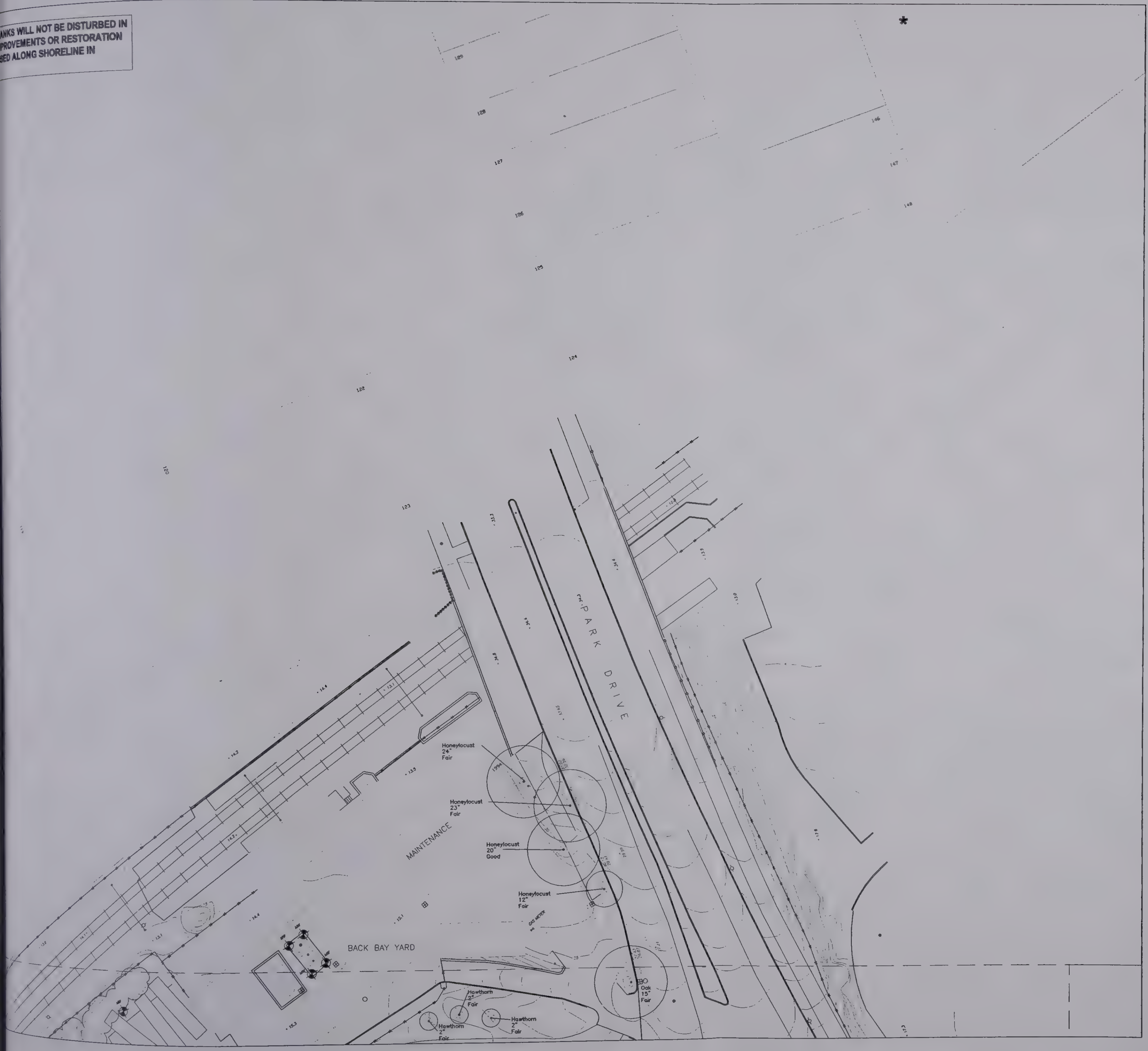
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L23

ANKS WILL NOT BE DISTURBED IN
PROVEMENTS OR RESTORATION
SED ALONG SHORELINE IN



LEGEND

PROPOSED SHORELINE LOCATION	〜
EXISTING SHORELINE TO BE RETAINED	- - -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▧
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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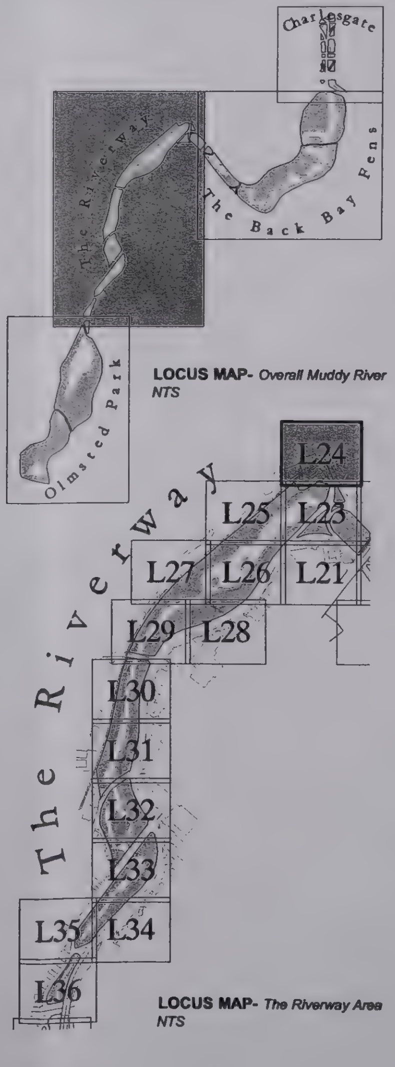

LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *The Riverway Area*
NTS

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DRAWING TITLE

PRELIMINARY
DESIGN

GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
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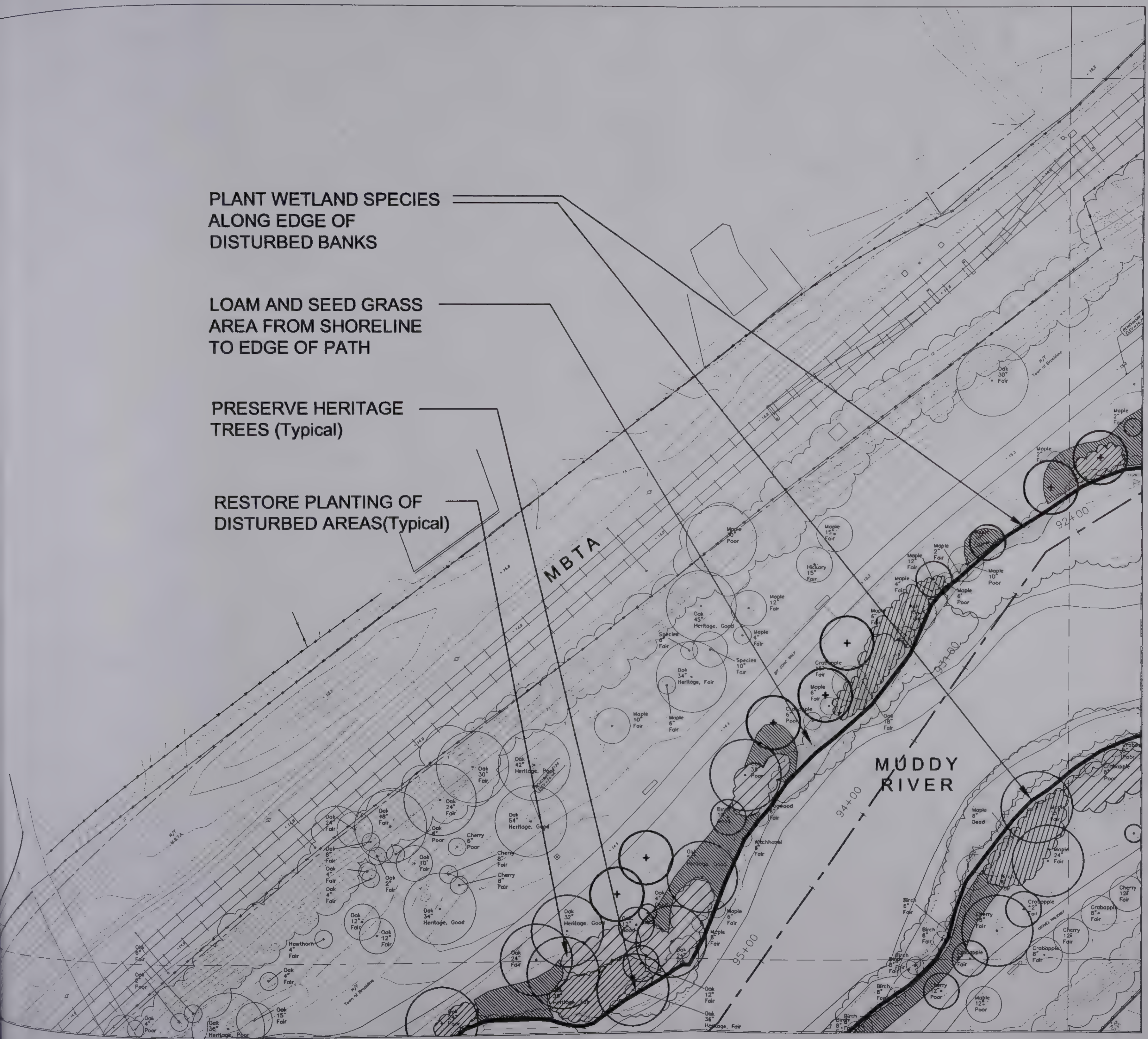
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L24


PLANT WETLAND SPECIES ALONG EDGE OF DISTURBED BANKS
LOAM AND SEED GRASS AREA FROM SHORELINE TO EDGE OF PATH
PRESERVE HERITAGE TREES (Typical)
RESTORE PLANTING OF DISTURBED AREAS(Typical)
MBTA
MUDDY RIVER
92+00
93+00
94+00
95+00

LEGEND

PROPOSED SHORELINE LOCATION	～
EXISTING SHORELINE TO BE RETAINED	‐ ‐ ‐
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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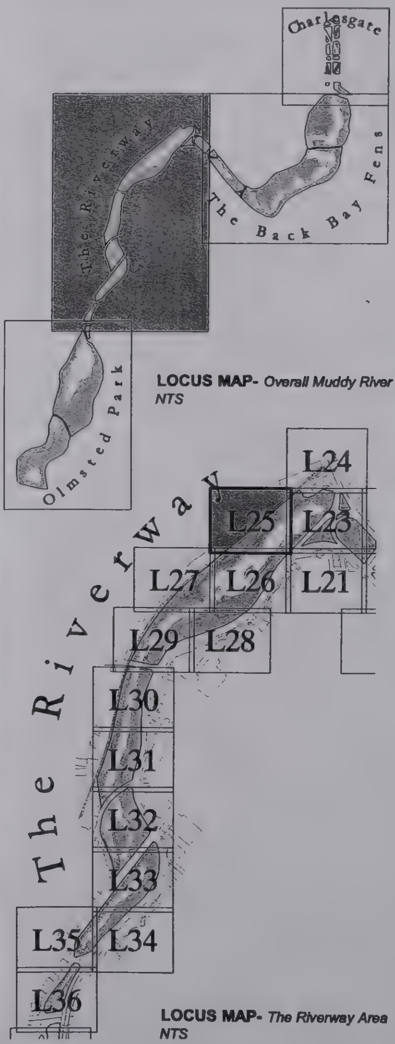

LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *The Riverway Area*
NTS

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REVISIONS

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DRAWING TITLE

PRELIMINARY
DESIGN

GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

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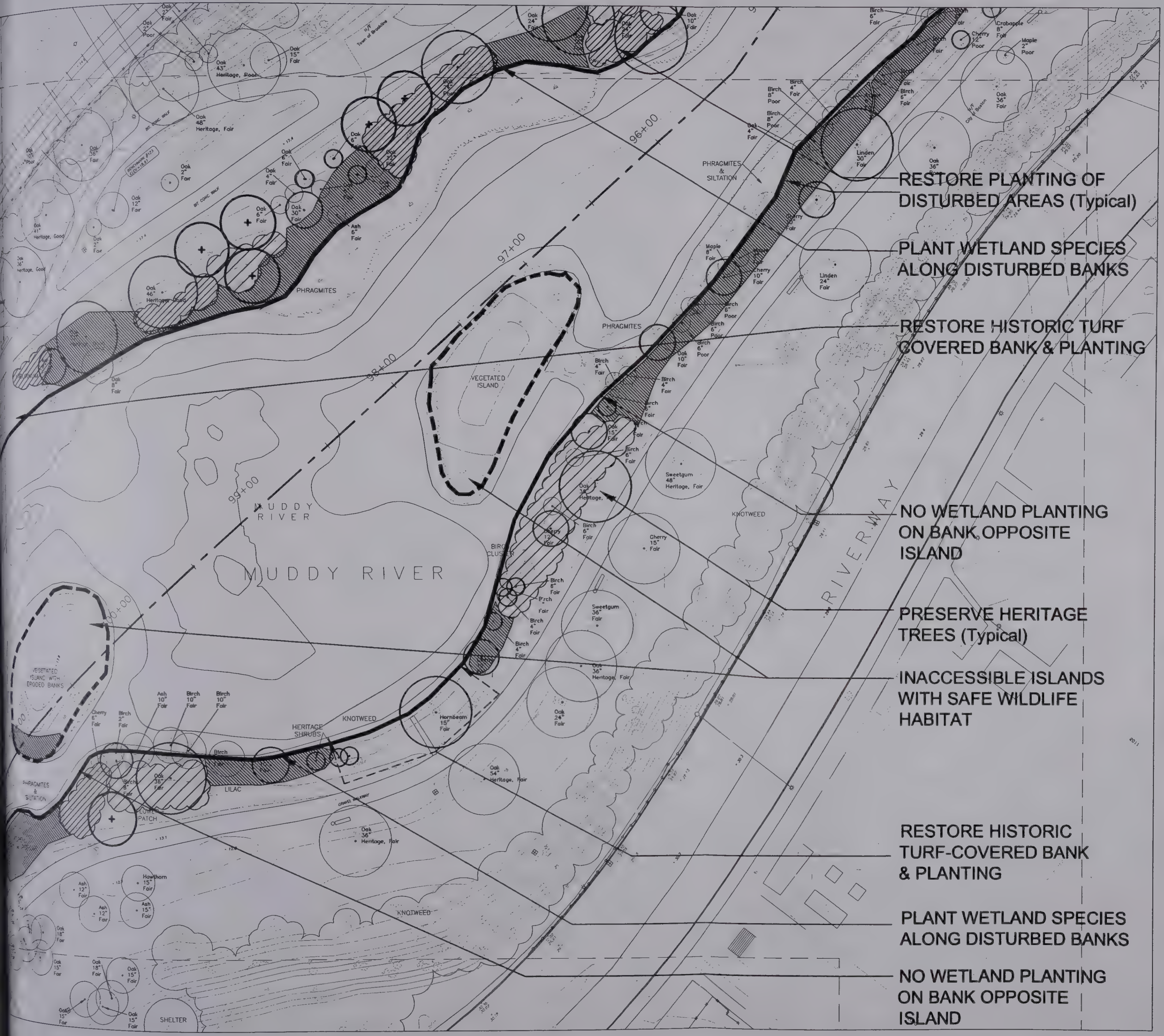
SCALE: 1"=60'

DRAWING NO.
L25


RESTORE PLANTING OF DISTURBED AREAS (Typical)
PLANT WETLAND SPECIES ALONG DISTURBED BANKS
RESTORE HISTORIC TURF COVERED BANK & PLANTING
NO WETLAND PLANTING ON BANK OPPOSITE ISLAND
PRESERVE HERITAGE TREES (Typical)
INACCESSIBLE ISLANDS WITH SAFE WILDLIFE HABITAT
RESTORE HISTORIC TURF-COVERED BANK & PLANTING
PLANT WETLAND SPECIES ALONG DISTURBED BANKS
NO WETLAND PLANTING ON BANK OPPOSITE ISLAND
MUDDY RIVER
RIVERWAY
96+00
97+00
98+00
99+00
VEGETATED ISLAND
VEGETATED ISLAND WITH ERODED BANKS
PHRAGMITES
PHRAGMITES & SILTATION
KNOTWEED
HERITAGE SHRUBS
LILAC
SHELTER
Oak 48" Heritage, Fair
Oak 43" Heritage, Poor
Oak 46" Heritage, Good
Sweetgum 48" Heritage, Fair
Sweetgum 36" Fair
Oak 36" Heritage, Fair
Oak 54" Heritage, Fair
Hornbeam 15" Fair
Linden 30" Fair
Linden 24" Fair
Cherry 15" Fair
Hawthorn 15" Fair

LEGEND

PROPOSED SHORELINE LOCATION	〜
EXISTING SHORELINE TO BE RETAINED	- - -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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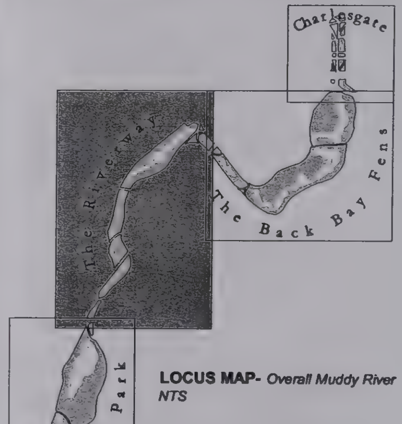
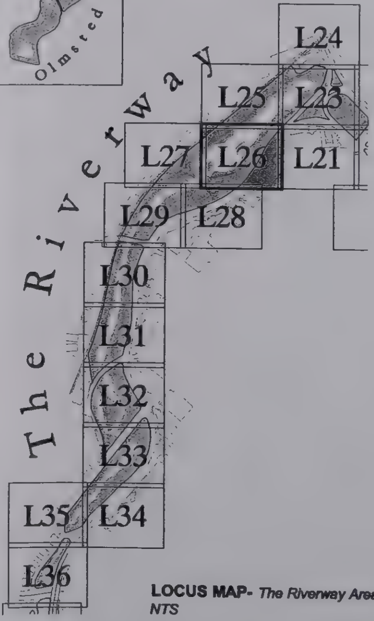


LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *The Riverway Area*
NTS

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Boston and Brookline, Massachusetts

REVISIONS

NO.	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

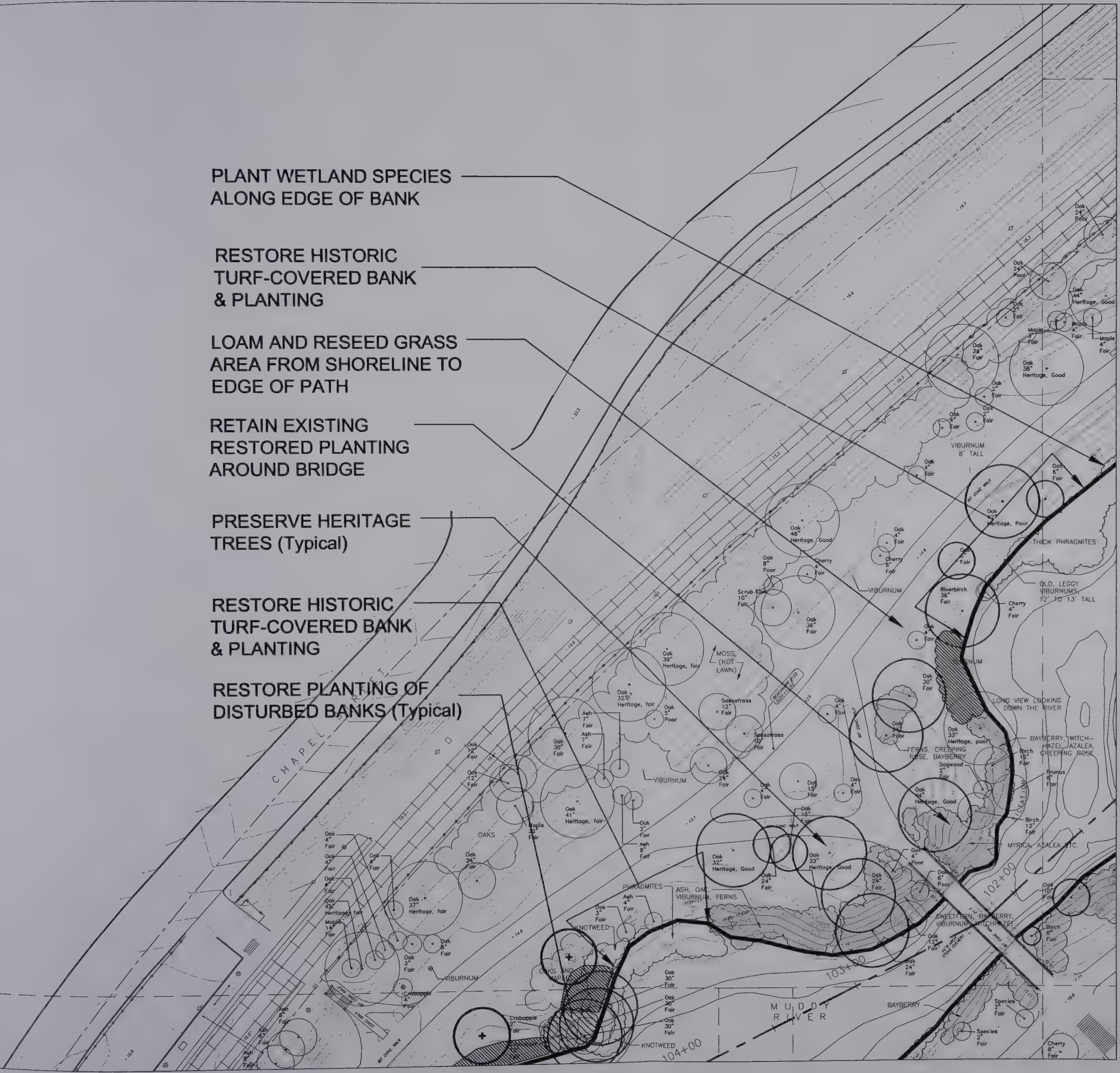
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY AE/MC/MM
CHECKED BY: MP
DATE: 12/15/00
SCALE 1"=60'

DRAWING NO.
L26



PLANT WETLAND SPECIES ALONG EDGE OF BANK

RESTORE HISTORIC TURF-COVERED BANK & PLANTING

LOAM AND RESEED GRASS AREA FROM SHORELINE TO EDGE OF PATH

RETAIN EXISTING RESTORED PLANTING AROUND BRIDGE

PRESERVE HERITAGE TREES (Typical)

RESTORE HISTORIC TURF-COVERED BANK & PLANTING

RESTORE PLANTING OF DISTURBED BANKS (Typical)

LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	- -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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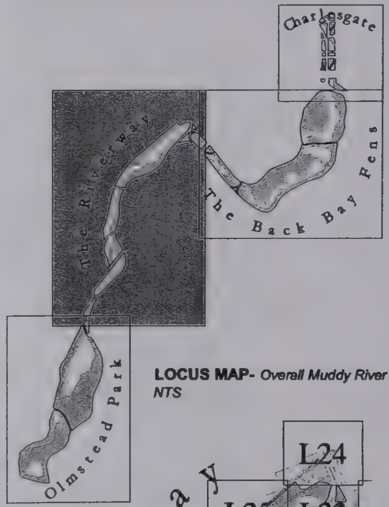
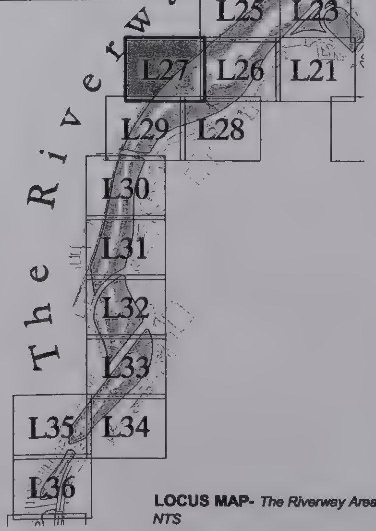


LOCUS MAP- *Overall Muddy River NTS*



LOCUS MAP- *The Riverway Area NTS*

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO.	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

GRAPHIC SCALE

20 0 20 40

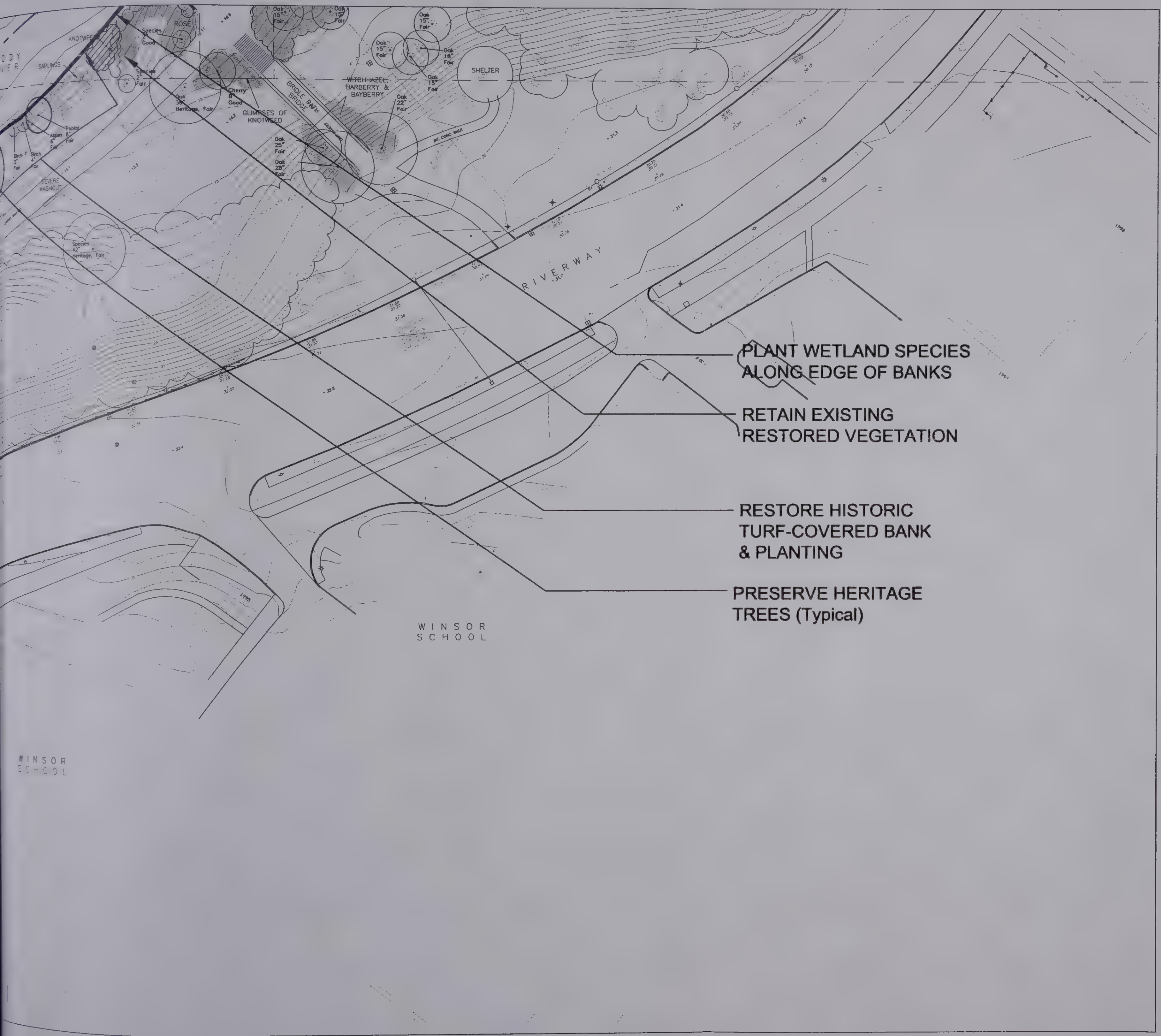
SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY: MP
DATE: 12/15/00
SCALE 1"=60'

DRAWING NO

L27



PLANT WETLAND SPECIES ALONG EDGE OF BANKS

RETAIN EXISTING RESTORED VEGETATION

RESTORE HISTORIC TURF-COVERED BANK & PLANTING

PRESERVE HERITAGE TREES (Typical)

LEGEND

PROPOSED SHORELINE LOCATION	∼
EXISTING SHORELINE TO BE RETAINED	- -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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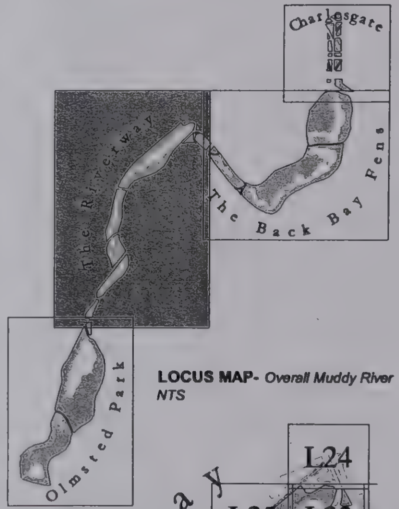
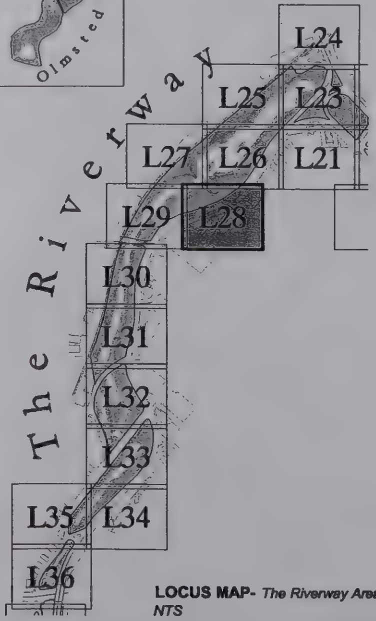


LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *The Riverway Area*
NTS

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REVISIONS

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DRAWING TITLE

PRELIMINARY DESIGN

GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
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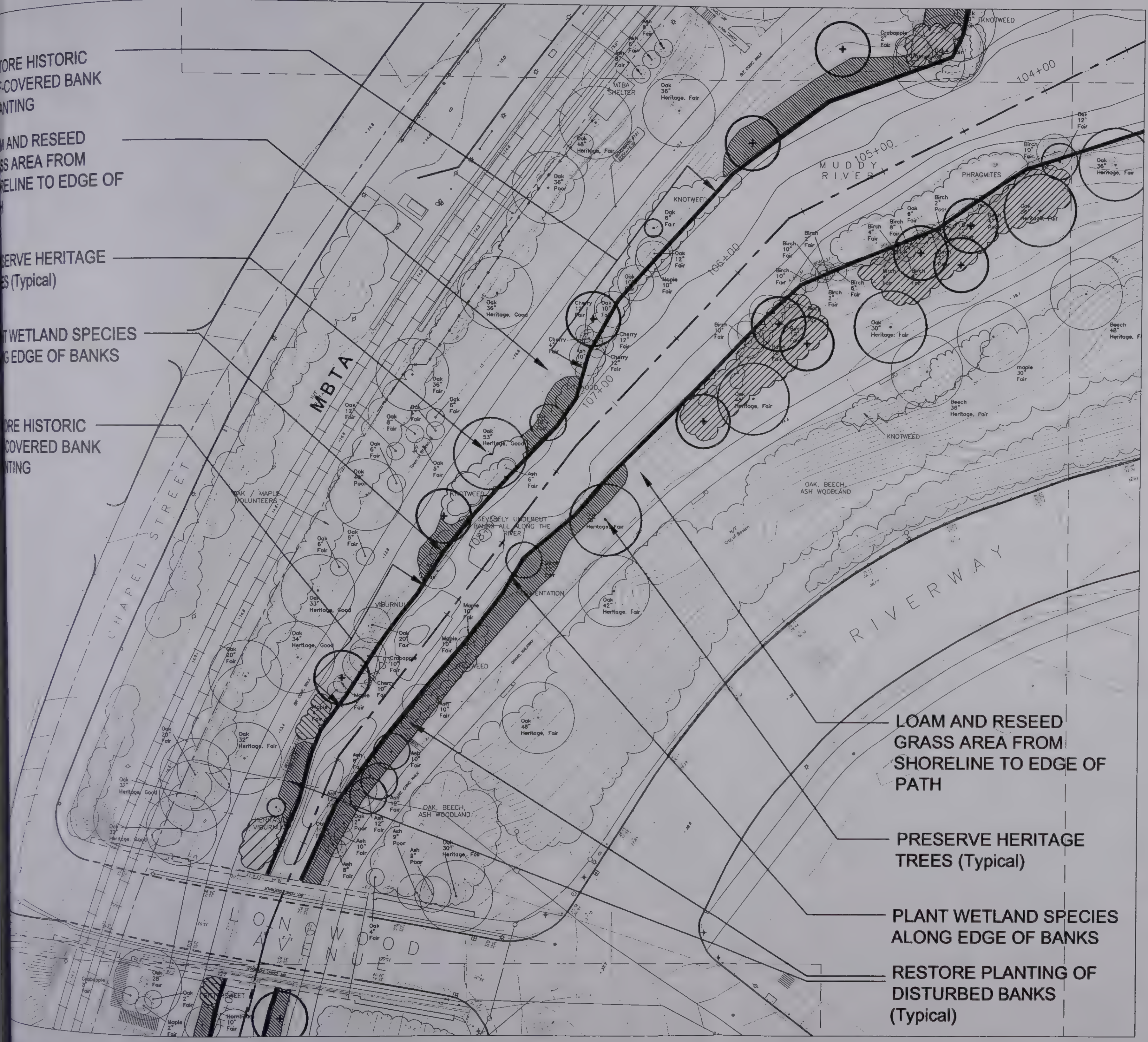
SCALE: 1"=60'

DRAWING NO.

L28



TORE HISTORIC
-COVERED BANK
NTING

M AND RESEED
SS AREA FROM
RELINE TO EDGE OF
H

SERVE HERITAGE
S (Typical)

T WETLAND SPECIES
G EDGE OF BANKS

ORE HISTORIC
COVERED BANK
NTING

LOAM AND RESEED GRASS AREA FROM SHORELINE TO EDGE OF PATH

PRESERVE HERITAGE TREES (Typical)

PLANT WETLAND SPECIES ALONG EDGE OF BANKS

RESTORE PLANTING OF DISTURBED BANKS (Typical)

LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	- -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▧
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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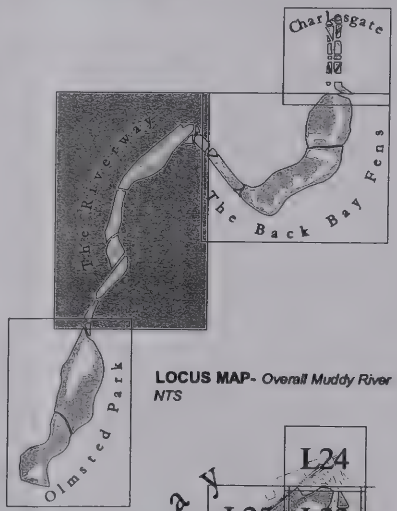
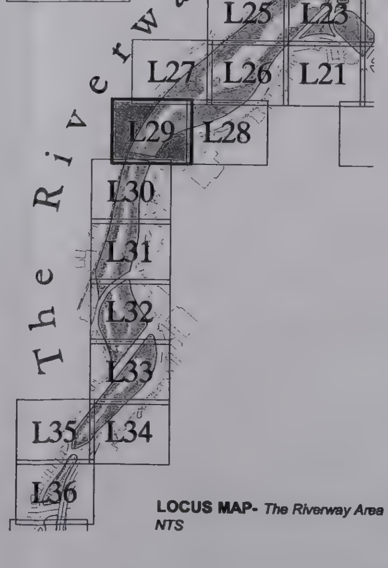


LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *The Riverway Area*
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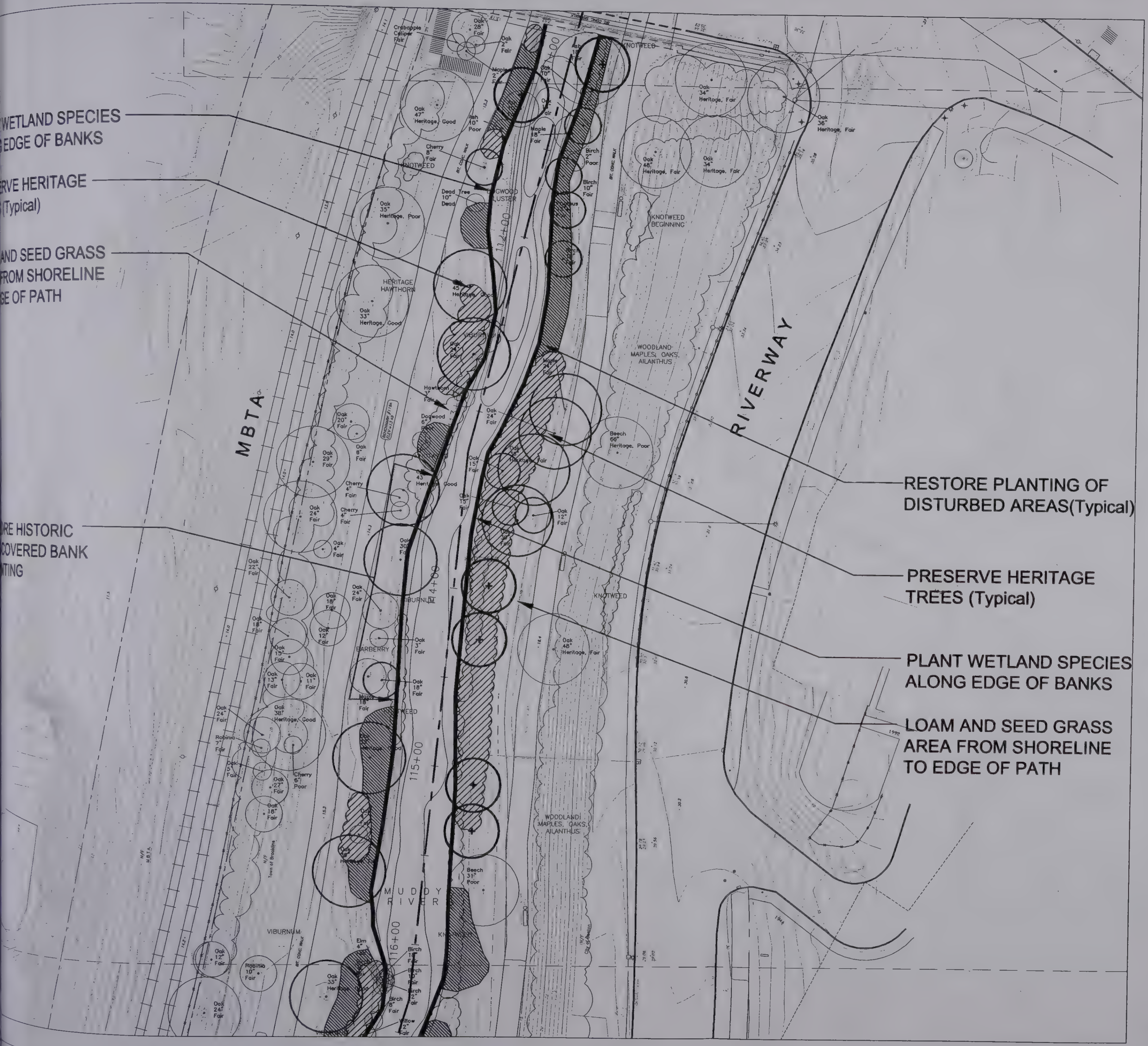

LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	~
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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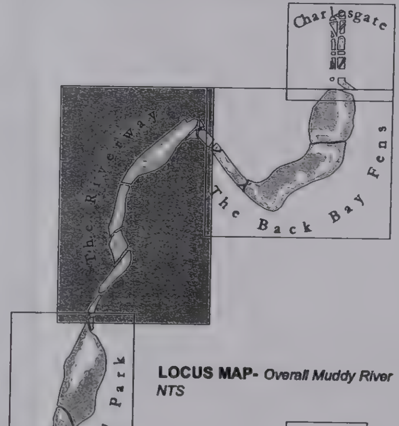
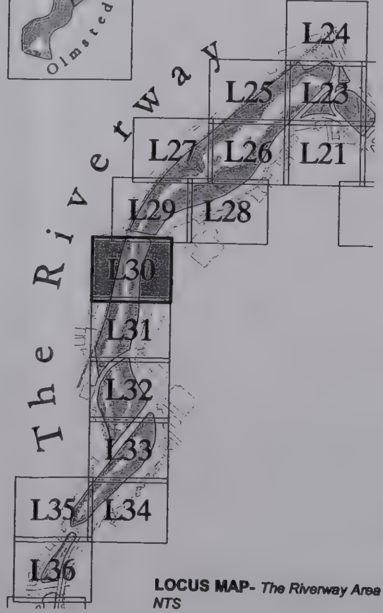


LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *The Riverway Area*
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20 0 20 40

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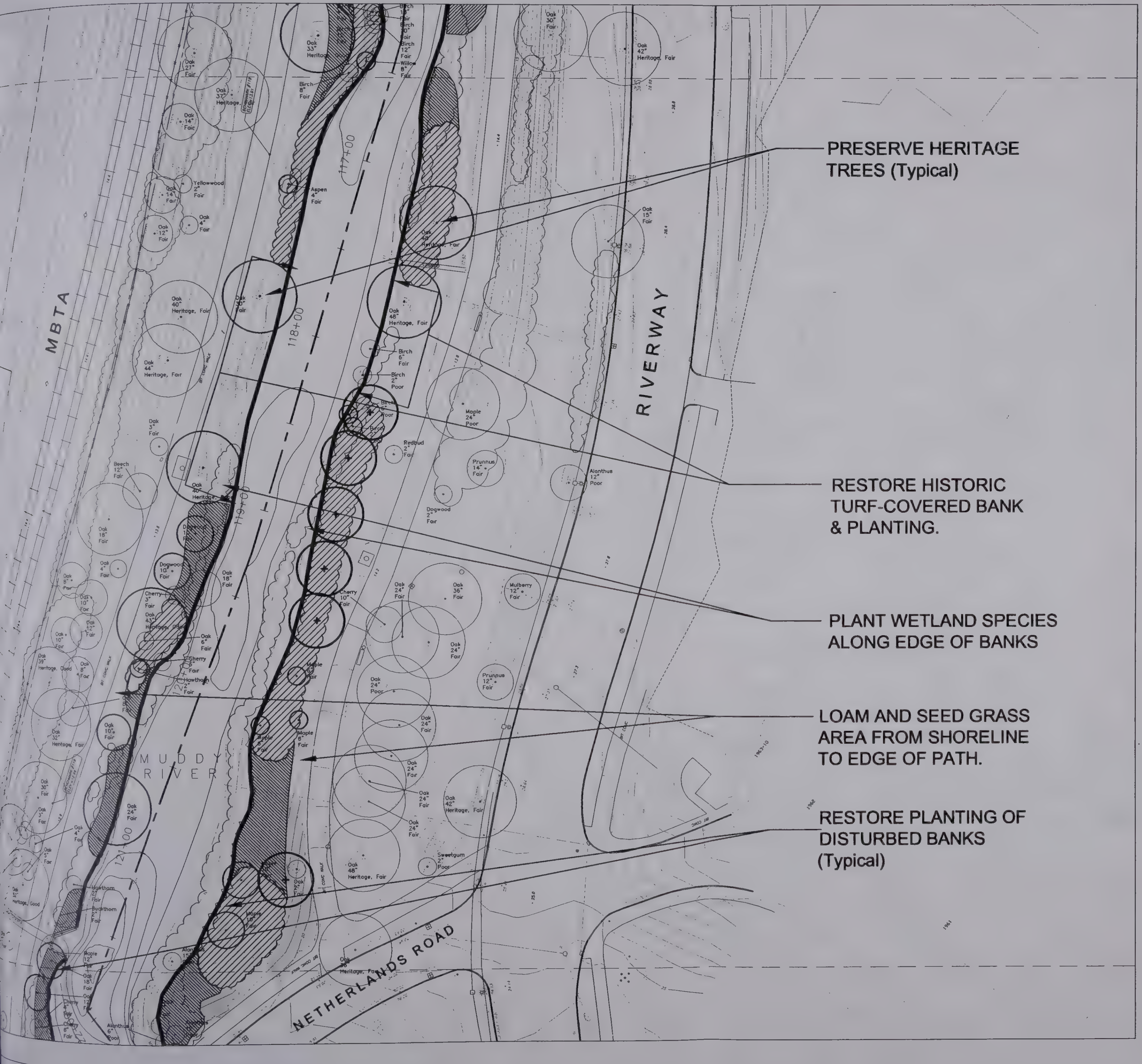
DRAWING NO.
L30



PRESERVE HERITAGE TREES (Typical)

RESTORE HISTORIC TURF-COVERED BANK & PLANTING.

PLANT WETLAND SPECIES ALONG EDGE OF BANKS

LOAM AND SEED GRASS AREA FROM SHORELINE TO EDGE OF PATH.

RESTORE PLANTING OF DISTURBED BANKS (Typical)

LEGEND

PROPOSED SHORELINE LOCATION	～
EXISTING SHORELINE TO BE RETAINED	╌
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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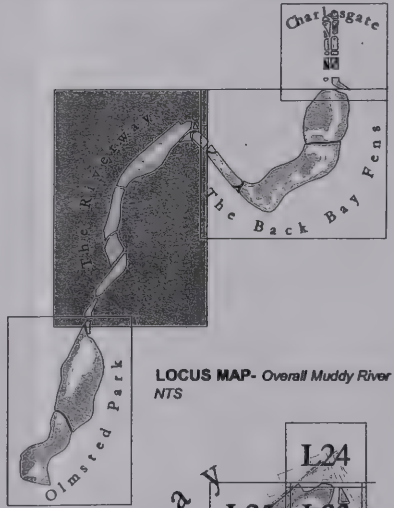
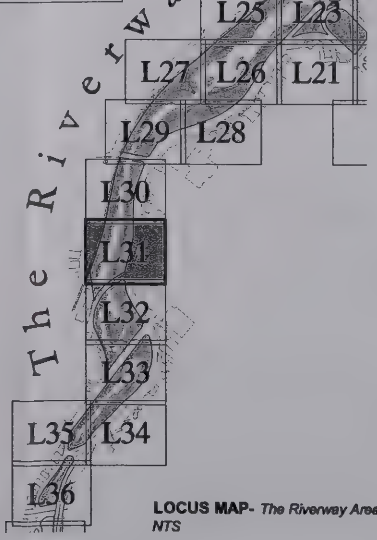


LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *The Riverway Area*
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DRAWING TITLE

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DESIGN

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SEAL

NORTH

DRAWN BY: SF/MC
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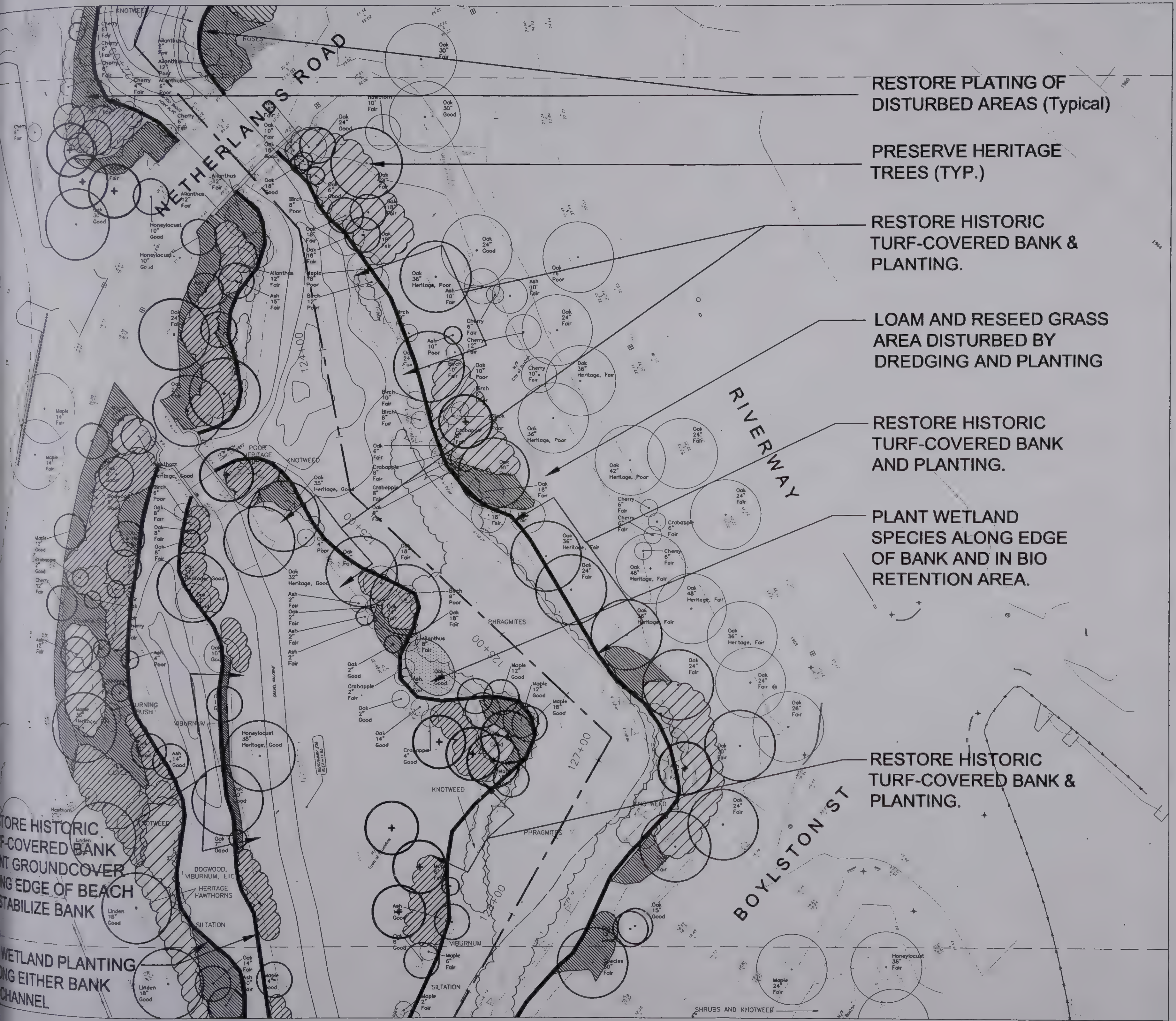
DATE: 12/15/00
SCALE 1"=60'

DRAWING NO.
L31



RESTORE PLATING OF DISTURBED AREAS (Typical)

PRESERVE HERITAGE TREES (TYP.)

RESTORE HISTORIC TURF-COVERED BANK & PLANTING.

LOAM AND RESEED GRASS AREA DISTURBED BY DREDGING AND PLANTING

RESTORE HISTORIC TURF-COVERED BANK AND PLANTING.

PLANT WETLAND SPECIES ALONG EDGE OF BANK AND IN BIO RETENTION AREA.

RESTORE HISTORIC TURF-COVERED BANK & PLANTING.

TORE HISTORIC
F-COVERED BANK
NT GROUNDCOVER
NG EDGE OF BEACH
STABILIZE BANK

WETLAND PLANTING
NG EITHER BANK
CHANNEL

LEGEND

PROPOSED SHORELINE LOCATION	～
EXISTING SHORELINE TO BE RETAINED	- -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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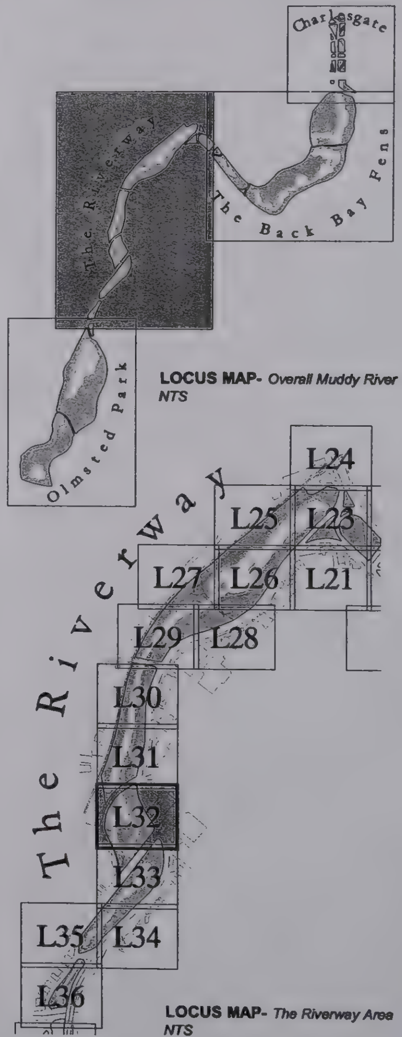

LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *The Riverway Area*
NTS

Pressley
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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO.	DATE	REMARKS

DRAWING TITLE
PRELIMINARY DESIGN

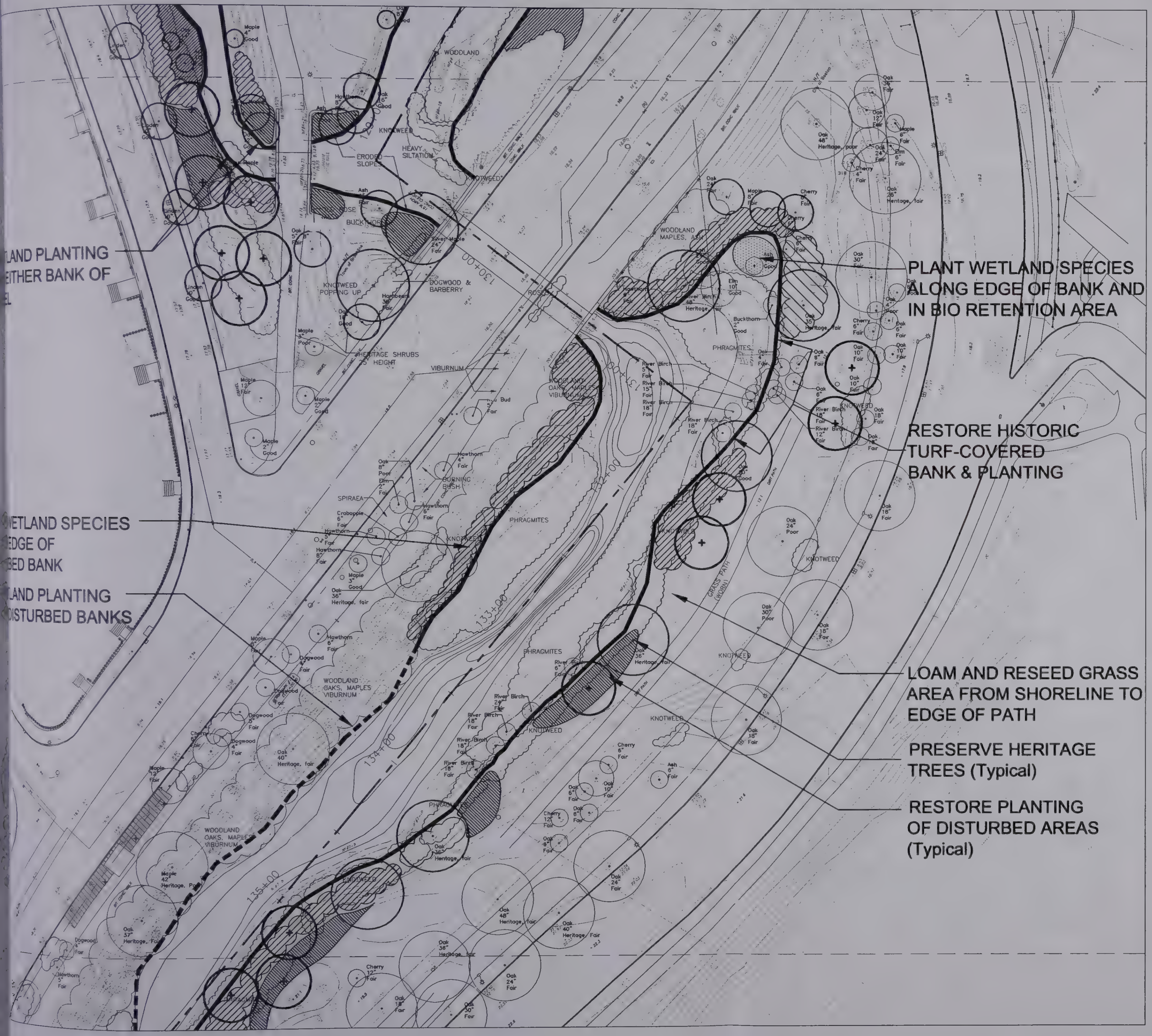
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L32

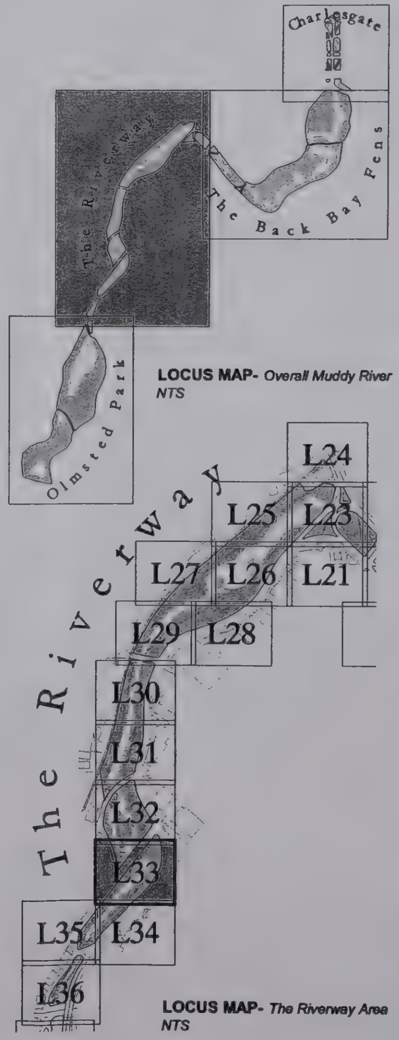

LAND PLANTING
EITHER BANK OF
L
WETLAND SPECIES
EDGE OF
BED BANK
LAND PLANTING
DISTURBED BANKS
PLANT WETLAND SPECIES ALONG EDGE OF BANK AND IN BIO RETENTION AREA
RESTORE HISTORIC TURF-COVERED BANK & PLANTING
LOAM AND RESEED GRASS AREA FROM SHORELINE TO EDGE OF PATH
PRESERVE HERITAGE TREES (Typical)
RESTORE PLANTING OF DISTURBED AREAS (Typical)
WOODLAND
KNOTWEED
HEAVY SILTATION
ERODED SLOPES
WOODLAND MAPLES
DOGWOOD & BARBERRY
KNOTWEED POPPING UP
HERITAGE SHRUBS
VIBURNUM
PHRAGMITES
SPIRAEA
WOODLAND OAKS, MAPLES VIBURNUM
GRASS PATH (WORN)
130+00
133+00
134+00
135+00

LEGEND

PROPOSED SHORELINE LOCATION	～
EXISTING SHORELINE TO BE RETAINED	- - -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

1) All disturbed areas remaining after implementation of planting to be loamed and re-seeded (except where noted on drawings).
2) Appropriate wetland species to be planted along length of disturbed banks, to a width of 2'-0" (except where noted on drawings).



LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *The Riverway Area*
NTS

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PRELIMINARY DESIGN

GRAPHIC SCALE

20 0 20 40

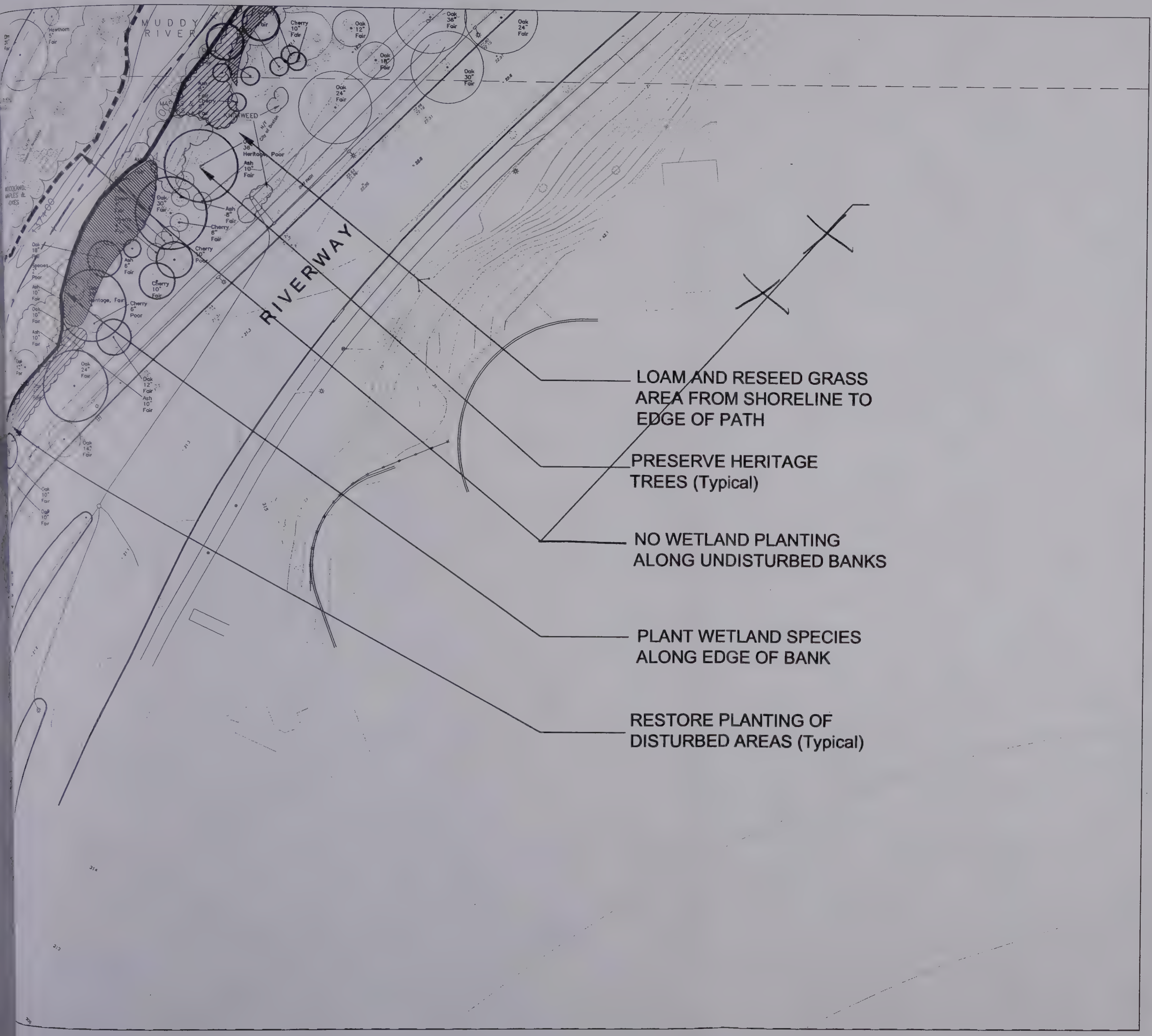
SEAL

NORTH

DRAWN BY: SF/MC
CHECKED BY: MP
DATE: 15/12/00
SCALE. 1"=60'

DRAWING NO.

L33



LOAM AND RESEED GRASS AREA FROM SHORELINE TO EDGE OF PATH

PRESERVE HERITAGE TREES (Typical)

NO WETLAND PLANTING ALONG UNDISTURBED BANKS

PLANT WETLAND SPECIES ALONG EDGE OF BANK

RESTORE PLANTING OF DISTURBED AREAS (Typical)

LEGEND

PROPOSED SHORELINE LOCATION	～
EXISTING SHORELINE TO BE RETAINED	- ～ -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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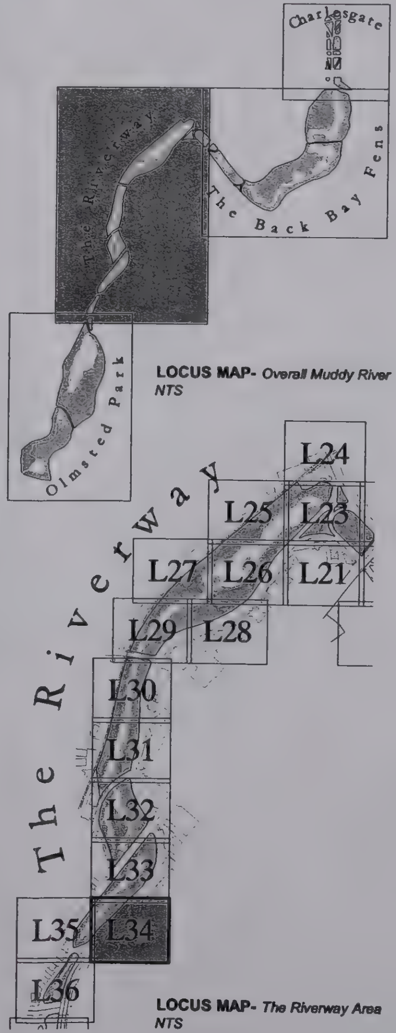

LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *The Riverway Area*
NTS

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Boston and Brookline, Massachusetts

REVISIONS

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PRELIMINARY DESIGN

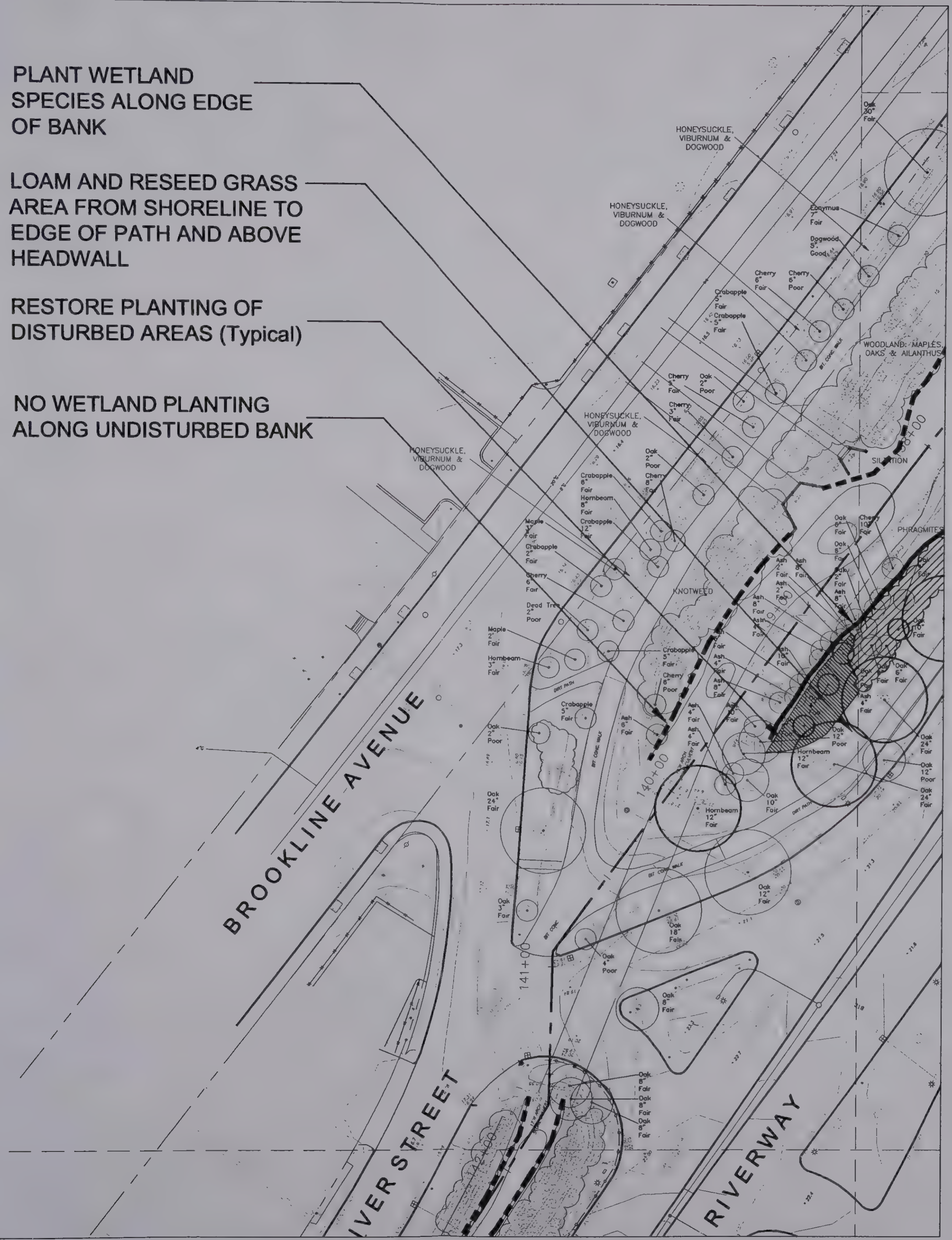
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L34


PLANT WETLAND SPECIES ALONG EDGE OF BANK

LOAM AND RESEED GRASS AREA FROM SHORELINE TO EDGE OF PATH AND ABOVE HEADWALL

RESTORE PLANTING OF DISTURBED AREAS (Typical)

NO WETLAND PLANTING ALONG UNDISTURBED BANK

LEGEND	
PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	‐ ‐ ‐
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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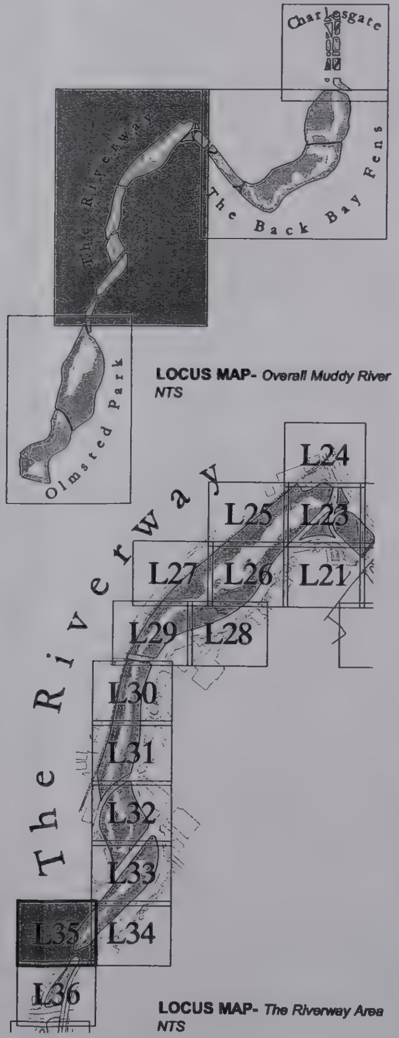

LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *The Riverway Area*
NTS

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Boston and Brookline, Massachusetts

REVISIONS

NO.	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

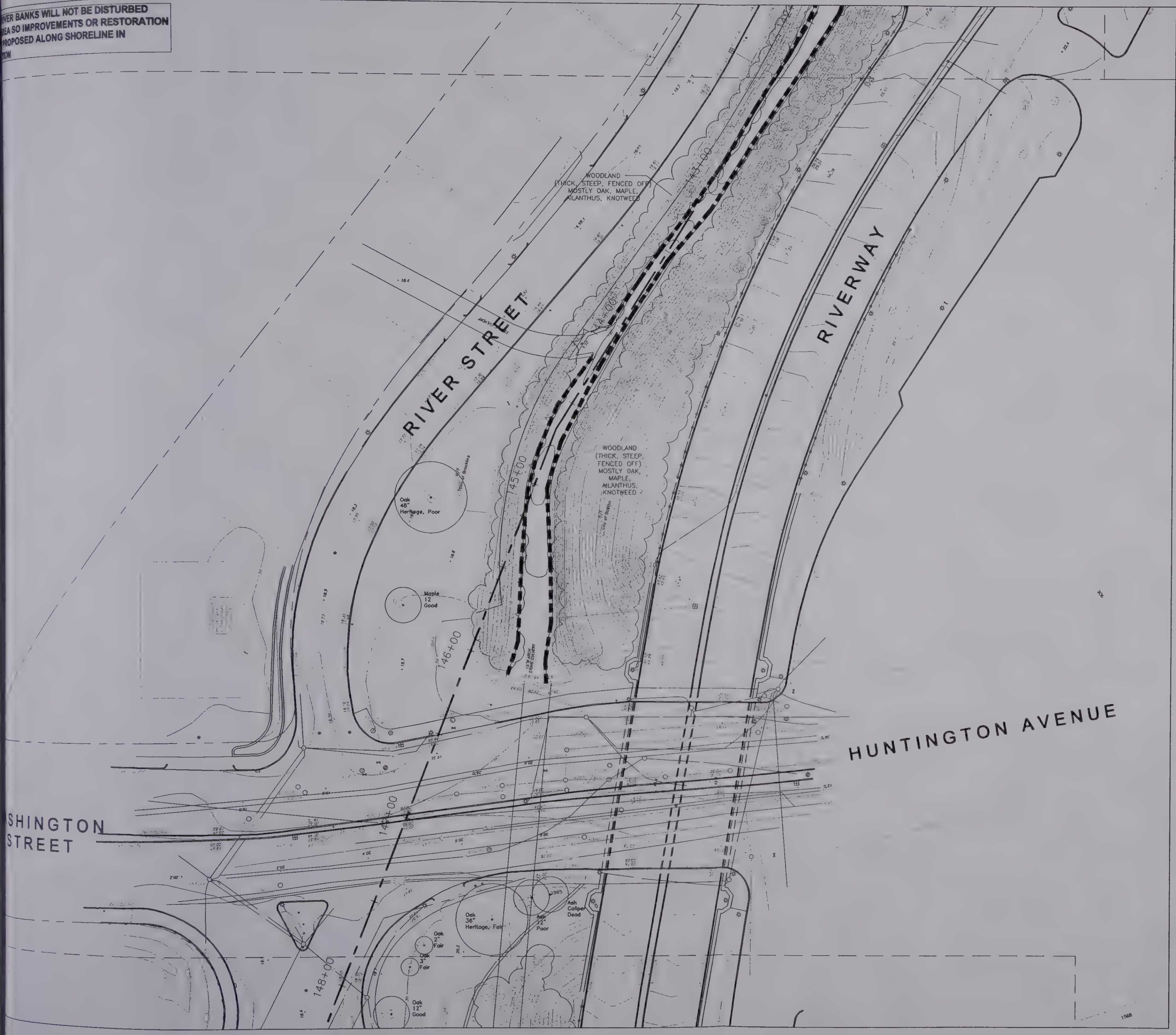
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L35



VER BANKS WILL NOT BE DISTURBED
EA SO IMPROVEMENTS OR RESTORATION
PROPOSED ALONG SHORELINE IN
TION

LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	- - -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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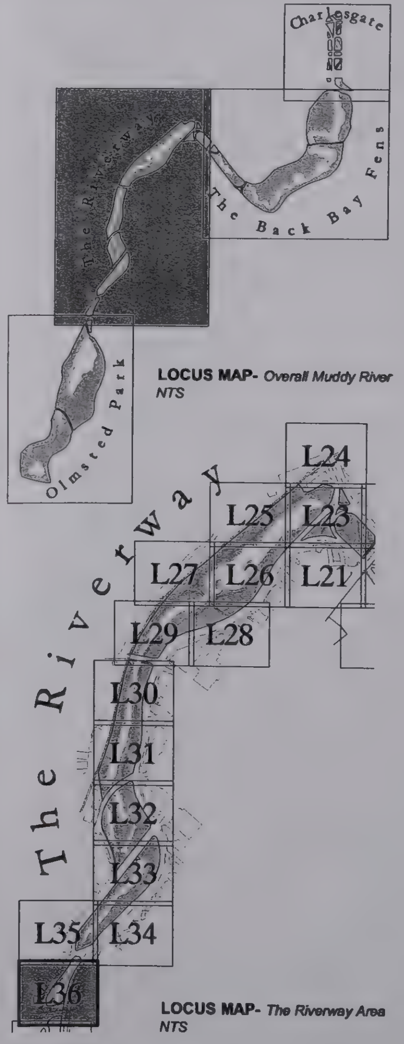

LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *The Riverway Area*
NTS

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

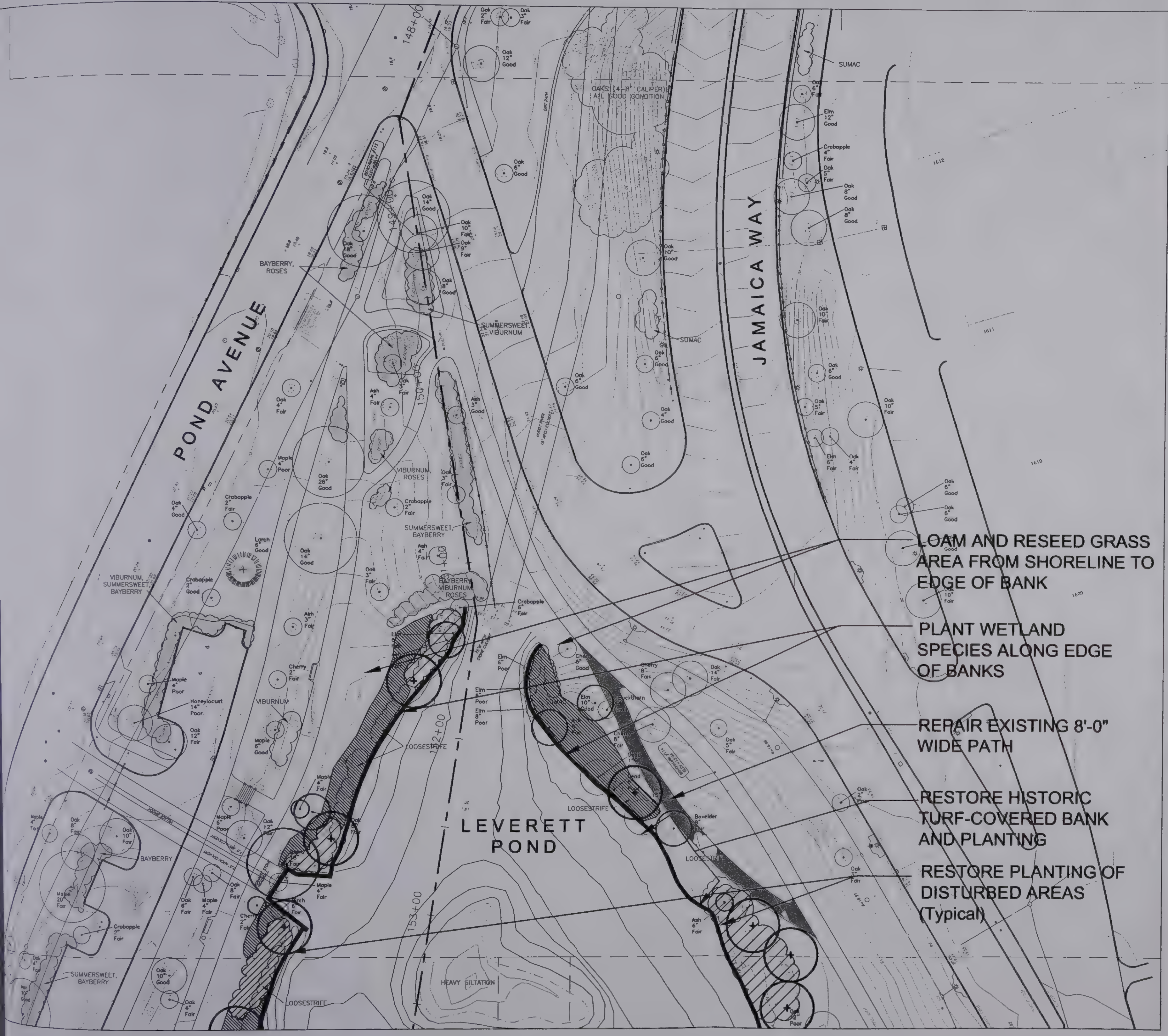
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY MP
DATE. 12/15/00
SCALE: 1"=60'

DRAWING NO.
L36


POND AVENUE
JAMAICA WAY
LEVERETT POND
148+00
149+00
150+00
151+00
152+00
153+00
OAKS (4"-8" CALIPER) ALL GOOD CONDITION
SUMAC
BAYBERRY, ROSES
SUMMERSWEET, VIBURNUM
VIBURNUM, ROSES
SUMMERSWEET, BAYBERRY
BAYBERRY, VIBURNUM, ROSES
VIBURNUM, SUMMERSWEET, BAYBERRY
VIBURNUM
BAYBERRY
SUMMERSWEET, BAYBERRY
LOOSESTRIFE
HEAVY SILTATION
LOAM AND RESEED GRASS AREA FROM SHORELINE TO EDGE OF BANK
PLANT WETLAND SPECIES ALONG EDGE OF BANKS
REPAIR EXISTING 8'-0" WIDE PATH
RESTORE HISTORIC TURF-COVERED BANK AND PLANTING
RESTORE PLANTING OF DISTURBED AREAS (Typical)

LEGEND

PROPOSED SHORELINE LOCATION	∼
EXISTING SHORELINE TO BE RETAINED	∼
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▧
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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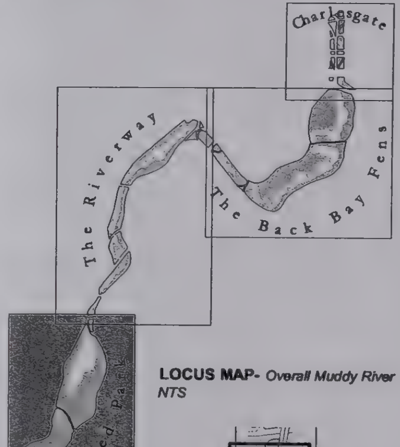
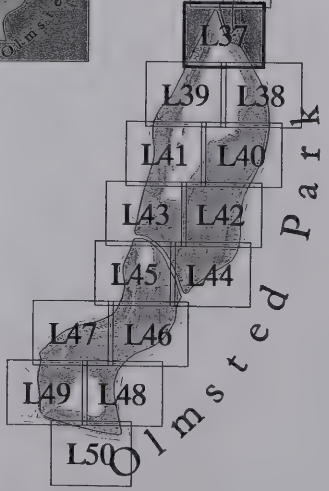


LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *Olmsted Park*
NTS

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Boston and Brookline, Massachusetts

REVISIONS

NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

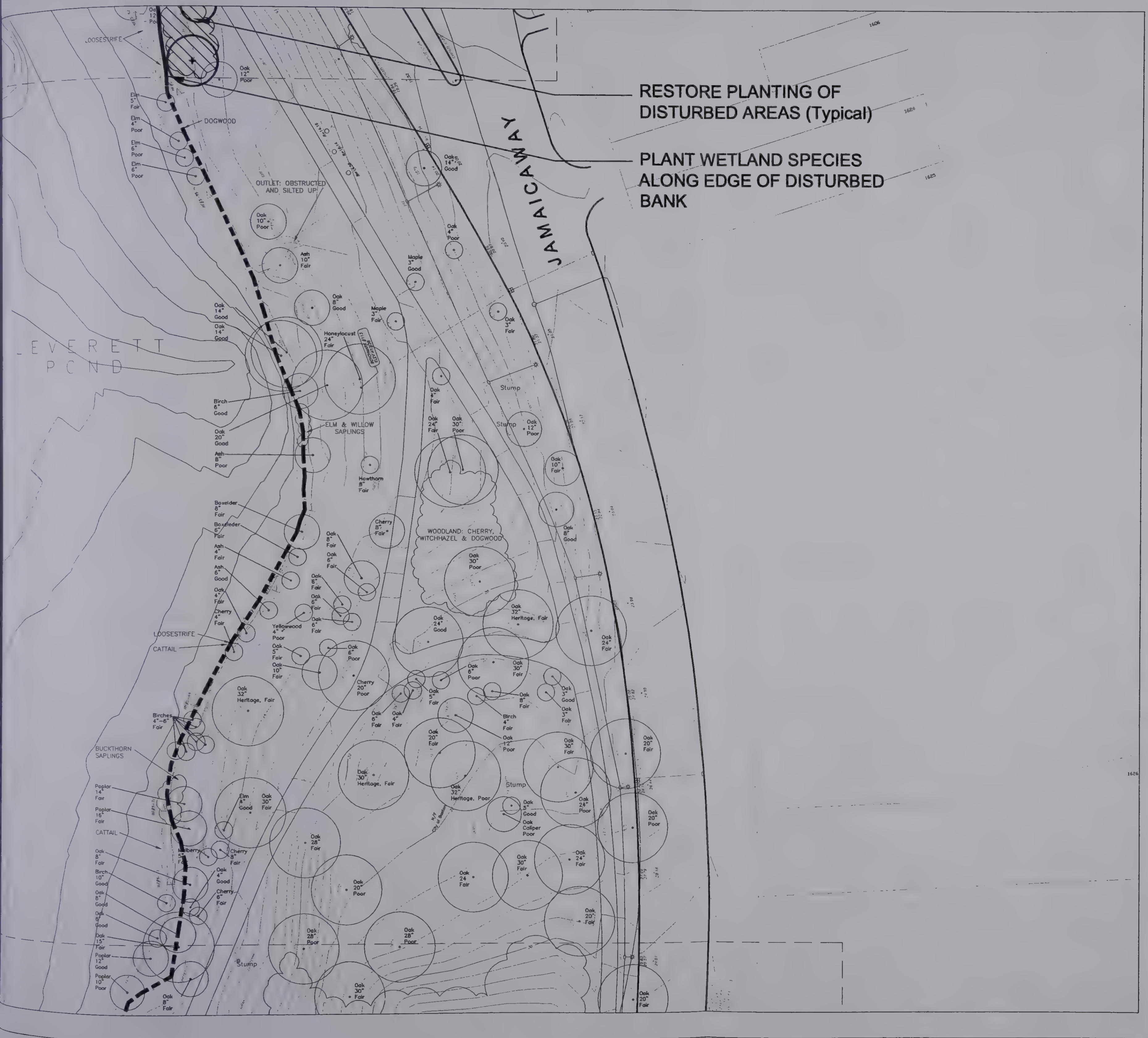
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L37



RESTORE PLANTING OF DISTURBED AREAS (Typical)

PLANT WETLAND SPECIES ALONG EDGE OF DISTURBED BANK

LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	- -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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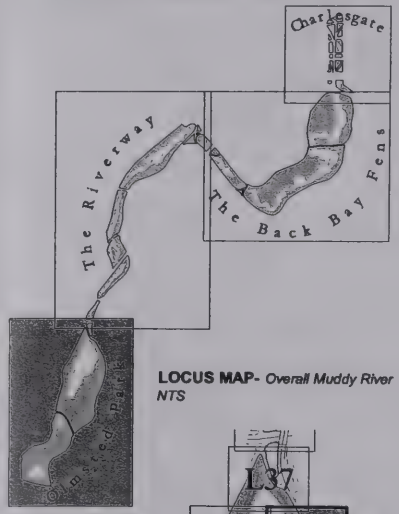
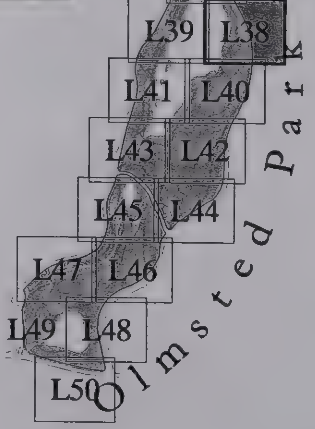


LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *Olmsted Park*
NTS

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

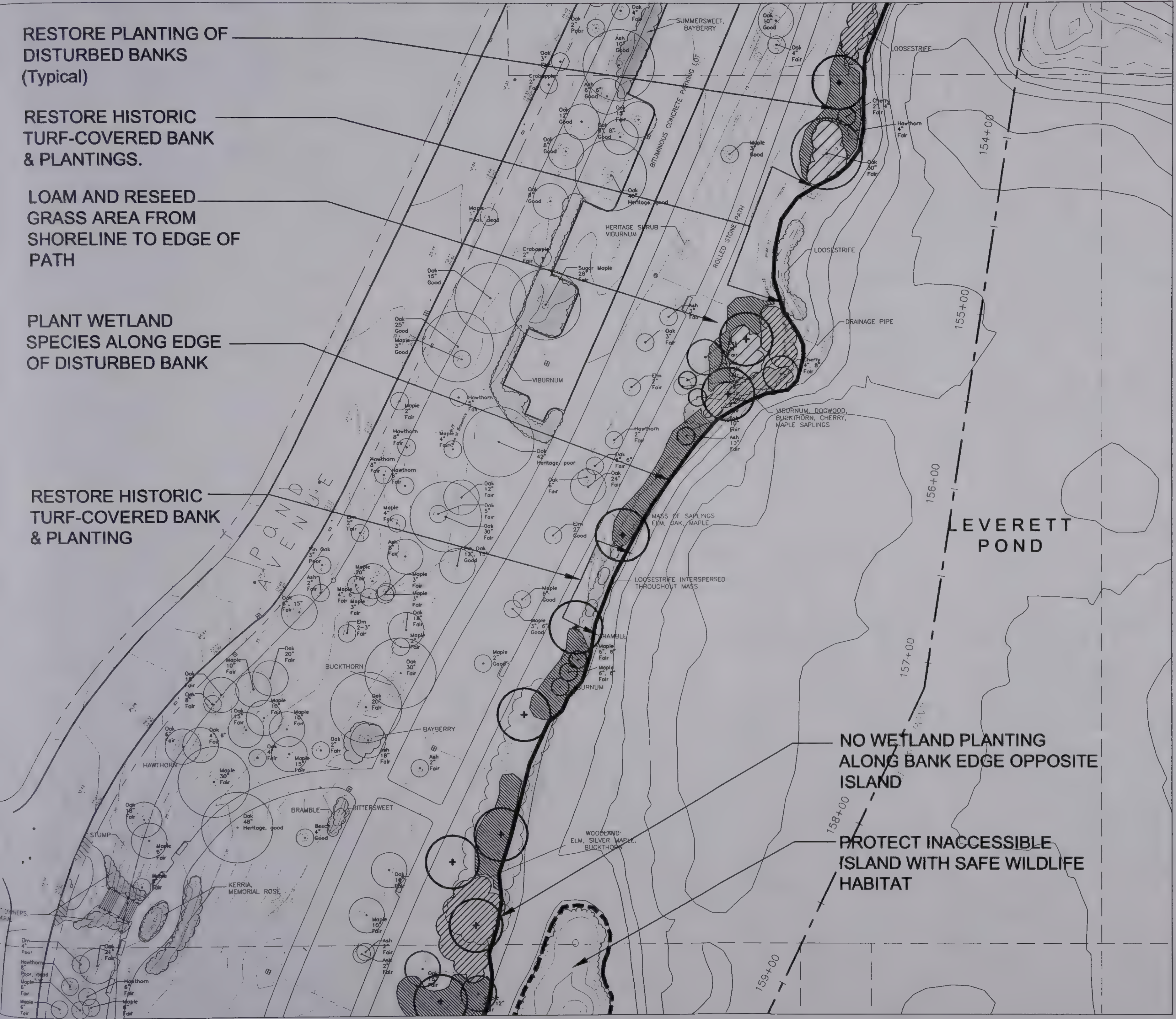
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: SF/MC
CHECKED BY: MP
DATE: 12/15/00
SCALE 1"=60'

DRAWING NO
L38



RESTORE PLANTING OF DISTURBED BANKS (Typical)

RESTORE HISTORIC TURF-COVERED BANK & PLANTINGS.

LOAM AND RESEED GRASS AREA FROM SHORELINE TO EDGE OF PATH

PLANT WETLAND SPECIES ALONG EDGE OF DISTURBED BANK

RESTORE HISTORIC TURF-COVERED BANK & PLANTING

NO WETLAND PLANTING ALONG BANK EDGE OPPOSITE ISLAND

PROTECT INACCESSIBLE ISLAND WITH SAFE WILDLIFE HABITAT

LEGEND

- PROPOSED SHORELINE LOCATION
- EXISTING SHORELINE TO BE RETAINED
- EXISTING TREES TO BE RETAINED
- PROPOSED TREE PLANTING
- PERENNIAL PLANTING
- LOW SHRUB PLANTING
- MEDIUM SHRUB PLANTING
- HIGH SHRUB PLANTING
- NEW OR REPLACEMENT PATHS

NOTES

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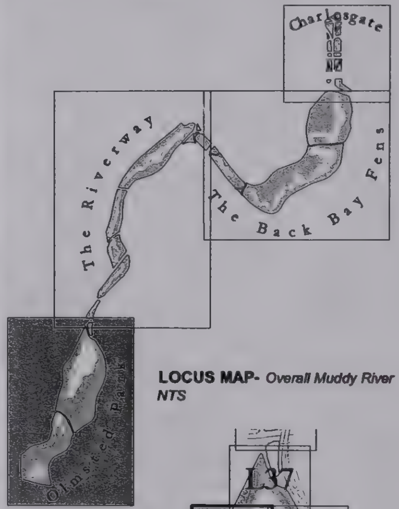

LOCUS MAP- *Overall Muddy River NTS*

LOCUS MAP- *Olmsted Park NTS*

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO.	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

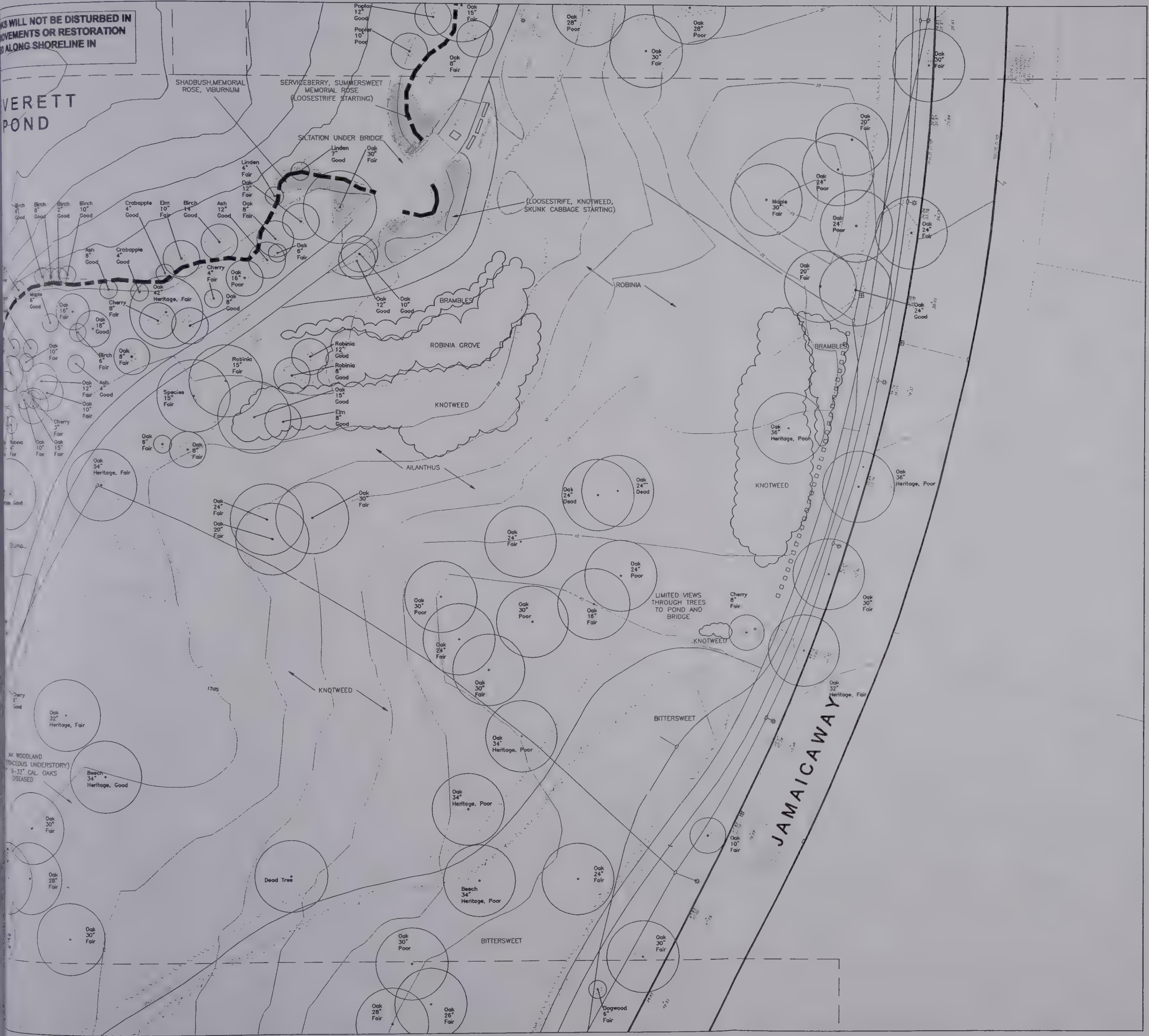
GRAPHIC SCALE 20 0 20 40

SEAL

NORTH

DRAWN BY: AE/MC/MM
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO
L39



LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	- - -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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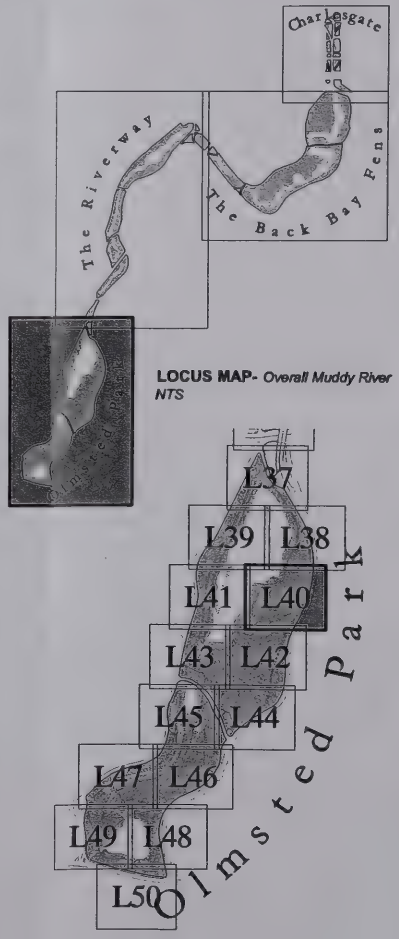

LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *Olmsted Park*
NTS

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Boston and Brookline, Massachusetts

REVISIONS

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PRELIMINARY DESIGN

GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
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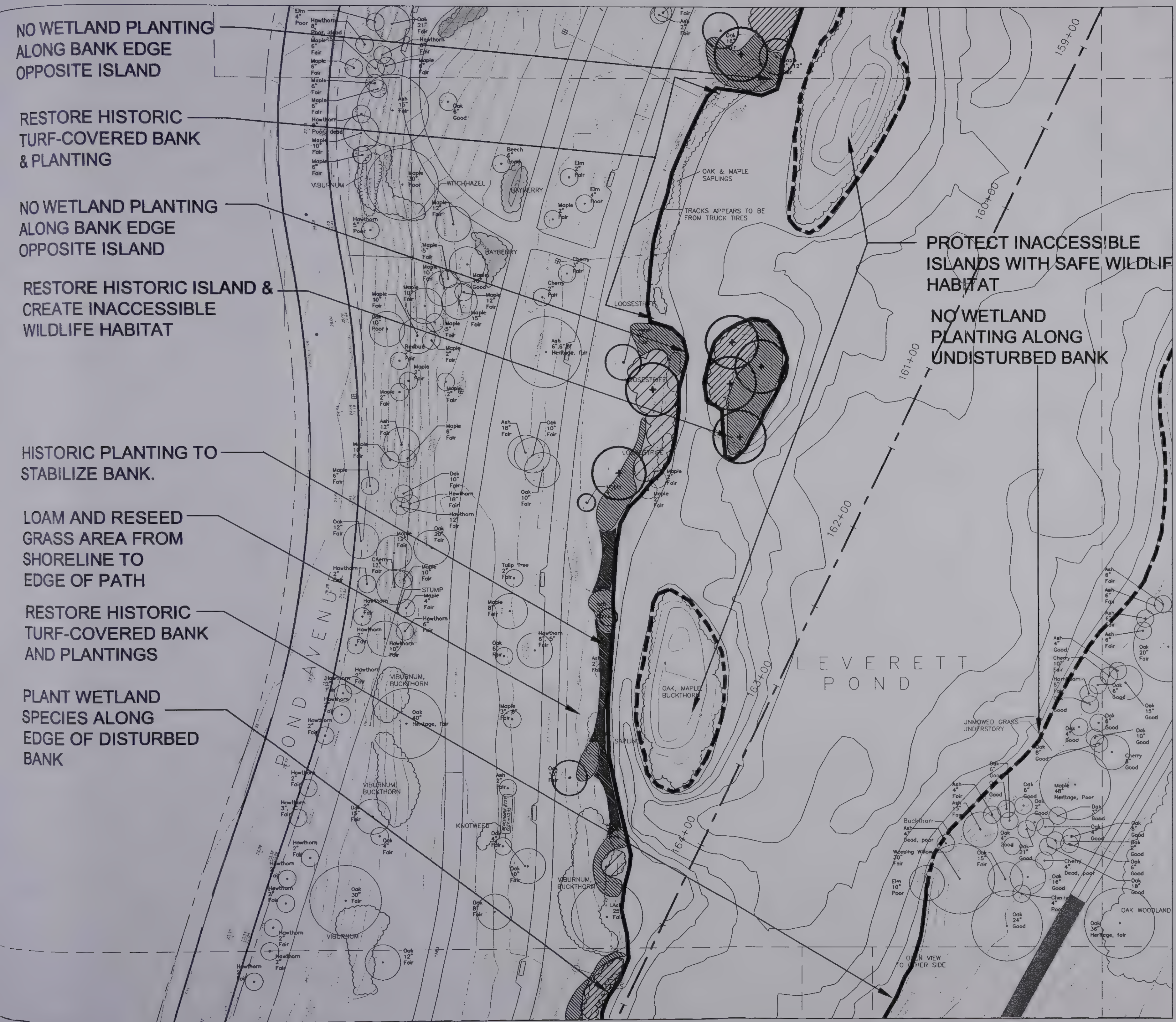
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L40


NO WETLAND PLANTING ALONG BANK EDGE OPPOSITE ISLAND
RESTORE HISTORIC TURF-COVERED BANK & PLANTING
NO WETLAND PLANTING ALONG BANK EDGE OPPOSITE ISLAND
RESTORE HISTORIC ISLAND & CREATE INACCESSIBLE WILDLIFE HABITAT
HISTORIC PLANTING TO STABILIZE BANK.
LOAM AND RESEED GRASS AREA FROM SHORELINE TO EDGE OF PATH
RESTORE HISTORIC TURF-COVERED BANK AND PLANTINGS
PLANT WETLAND SPECIES ALONG EDGE OF DISTURBED BANK
PROTECT INACCESSIBLE ISLANDS WITH SAFE WILDLIF HABITAT
NO WETLAND PLANTING ALONG UNDISTURBED BANK
POND AVENUE
LEVERETT POND
OAK & MAPLE SAPLINGS
TRACKS APPEARS TO BE FROM TRUCK TIRES
OAK, MAPLE, BUCKTHORN
UNMOWED GRASS UNDERSTORY
OPEN VIEW TO OTHER SIDE
OAK WOODLAND
VIBURNUM, BUCKTHORN
KNOTWEED
WITCHHAZEL
BAYBERRY
LOOSESTRIFE
159+00
160+00
161+00
162+00
163+00
164+00

LEGEND

PROPOSED SHORELINE LOCATION	∼
EXISTING SHORELINE TO BE RETAINED	- - -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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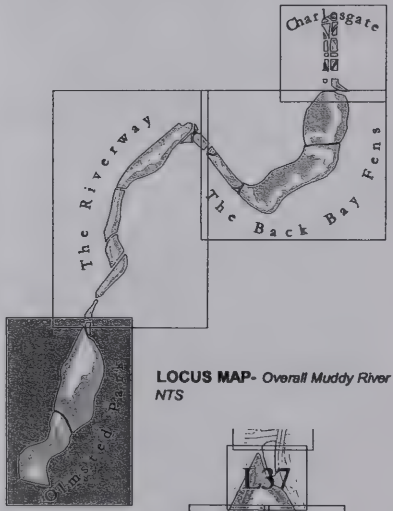
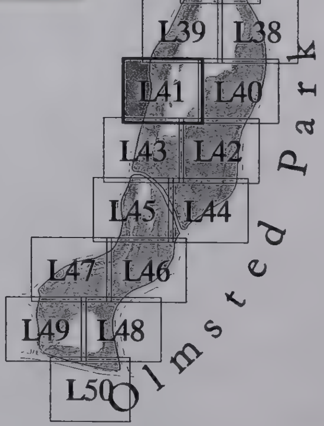


LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *Olmsted Park*
NTS

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PRELIMINARY DESIGN

GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SP
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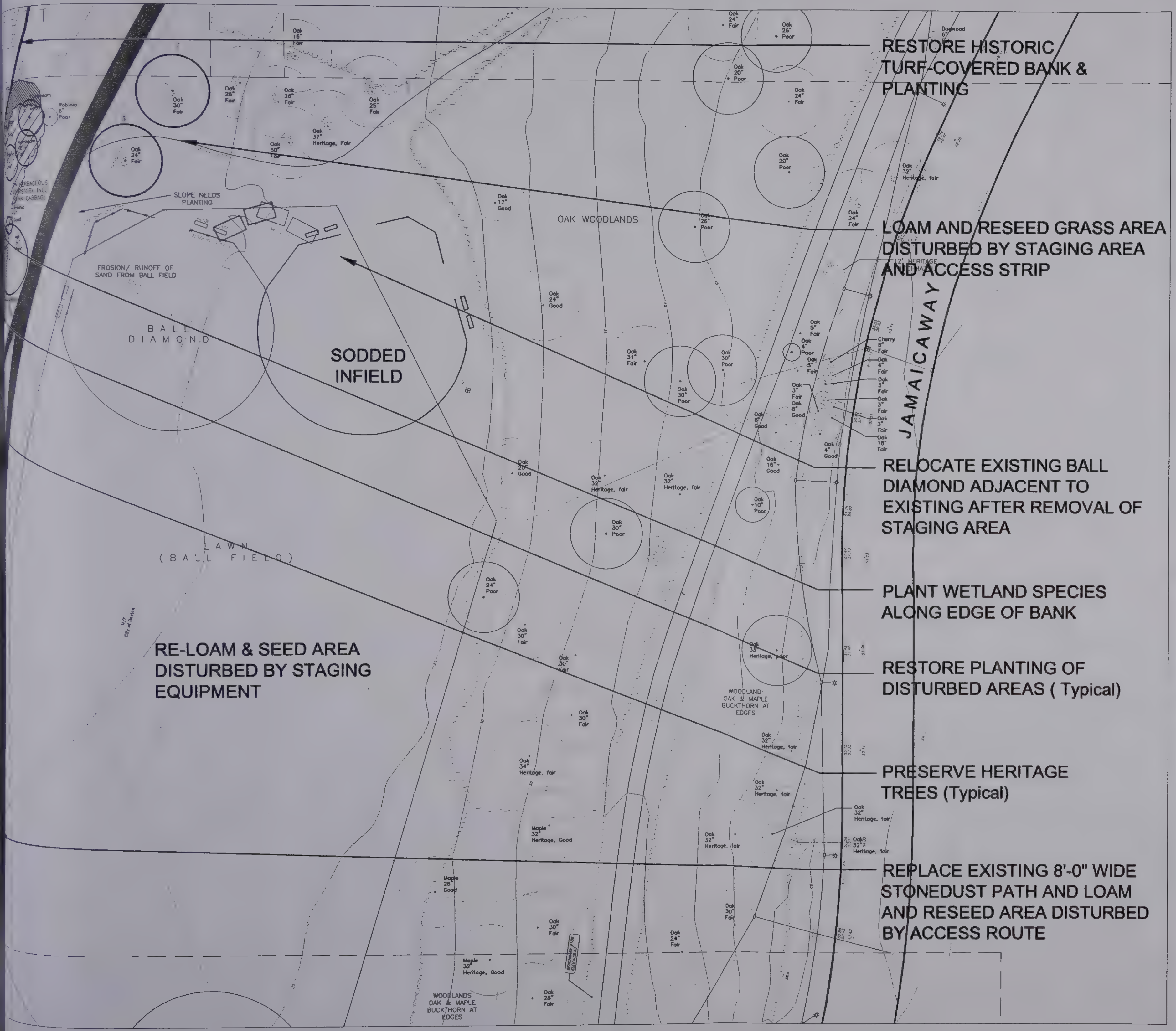
SCALE: 1"=60'

DRAWING NO.
L41



RESTORE HISTORIC TURF-COVERED BANK & PLANTING

LOAM AND RESEED GRASS AREA DISTURBED BY STAGING AREA AND ACCESS STRIP

RELOCATE EXISTING BALL DIAMOND ADJACENT TO EXISTING AFTER REMOVAL OF STAGING AREA

PLANT WETLAND SPECIES ALONG EDGE OF BANK

RESTORE PLANTING OF DISTURBED AREAS (Typical)

PRESERVE HERITAGE TREES (Typical)

REPLACE EXISTING 8'-0" WIDE STONEDUST PATH AND LOAM AND RESEED AREA DISTURBED BY ACCESS ROUTE

RE-LOAM & SEED AREA DISTURBED BY STAGING EQUIPMENT

LEGEND

PROPOSED SHORELINE LOCATION	∼
EXISTING SHORELINE TO BE RETAINED	‐ ‐ ‐
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▩
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▧
NEW OR REPLACEMENT PATHS	■

NOTES

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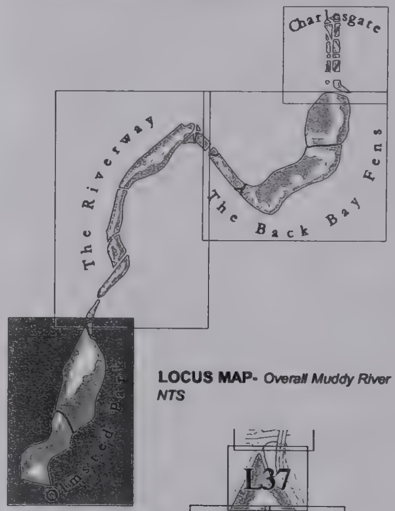
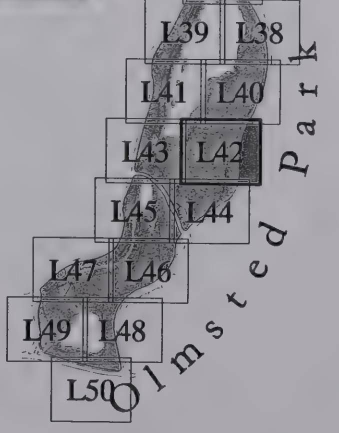


LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *Olmsted Park*
NTS

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SR
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L42

PLANT WETLAND SPECIES
ALONG EDGE OF BANK

LOAM AND RESEED GRASS
AREA FROM SHORELINE TO
EDGE OF PATH

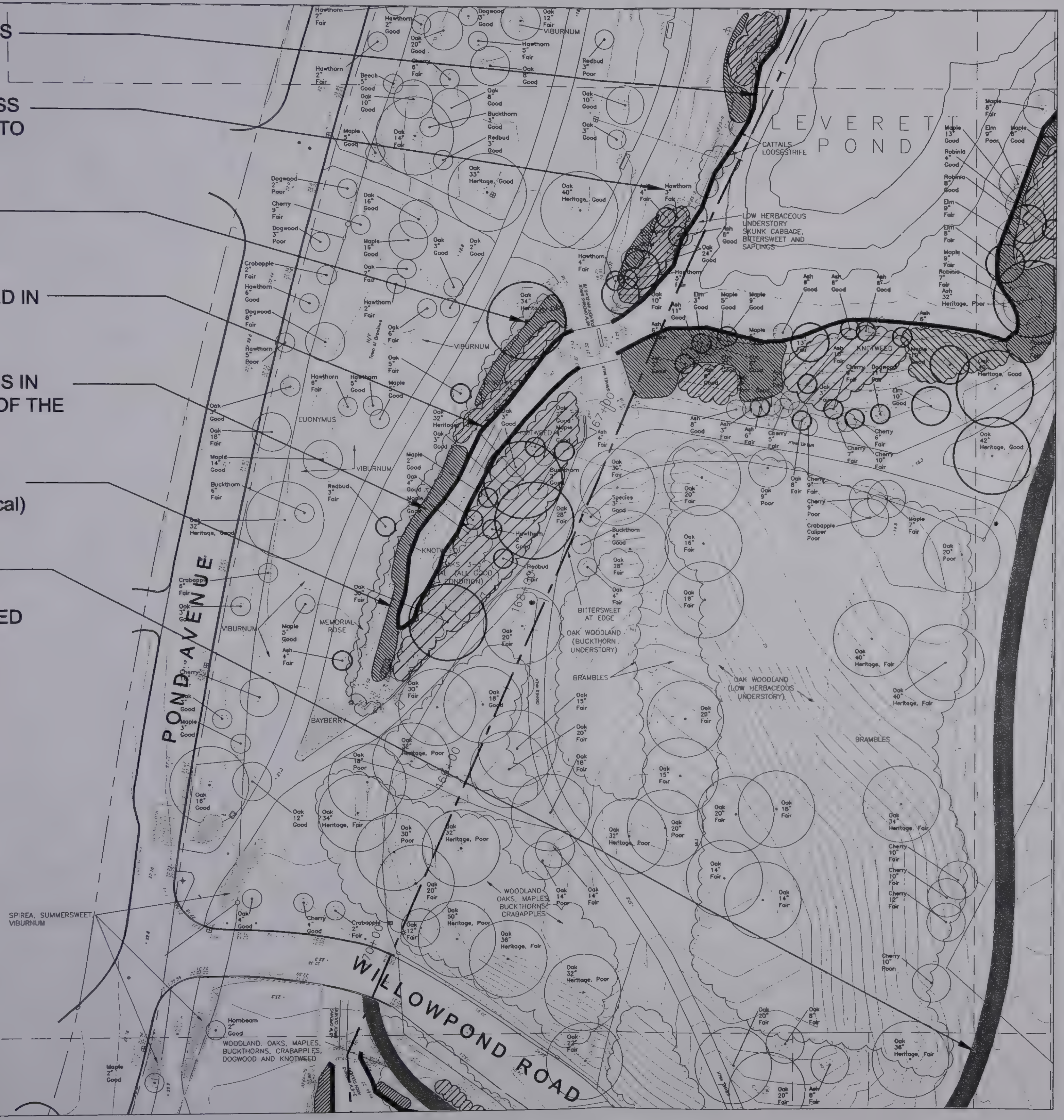
PRESERVE HERITAGE
TREES (Typical)

RECONSTRUCT ROCK BED IN
BABBLING BROOK

PLANT WETLAND SPECIES IN
GROUPS ALONG BANKS OF THE
BABBLING BROOK

RESTORE PLANTING OF
DISTURBED AREAS (Typical)

REPLACE EXISTING 8'-0"
WIDE STONEDUST AND
RESEED AREA DISTURBED
BY STAGING AREA AND
ACCESS ROUTE



LEGEND

PROPOSED SHORELINE LOCATION	〜
EXISTING SHORELINE TO BE RETAINED	- - -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▧
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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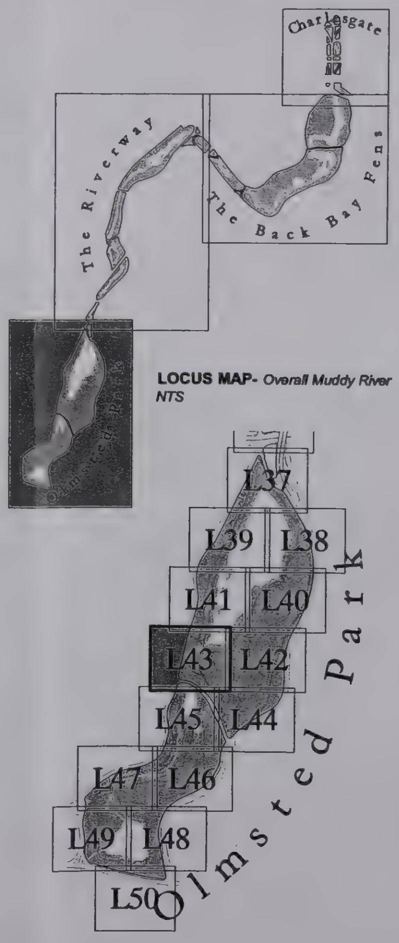
2) Appropriate wetland species to be planted along length of disturbed banks, to a width of 2'-0" (except where noted on drawings).



LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *Olmsted Park*
NTS

Pressley
Associates, Inc.
Landscape Architects
432 Columbia Street
Cambridge, MA 02141
Phone: (617) 491-5300
FAX: (617) 491-7502
Email: pressley@pressleyinc.com

The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO.	DATE	REMARKS

DRAWING TITLE

PRELIMINARY
DESIGN

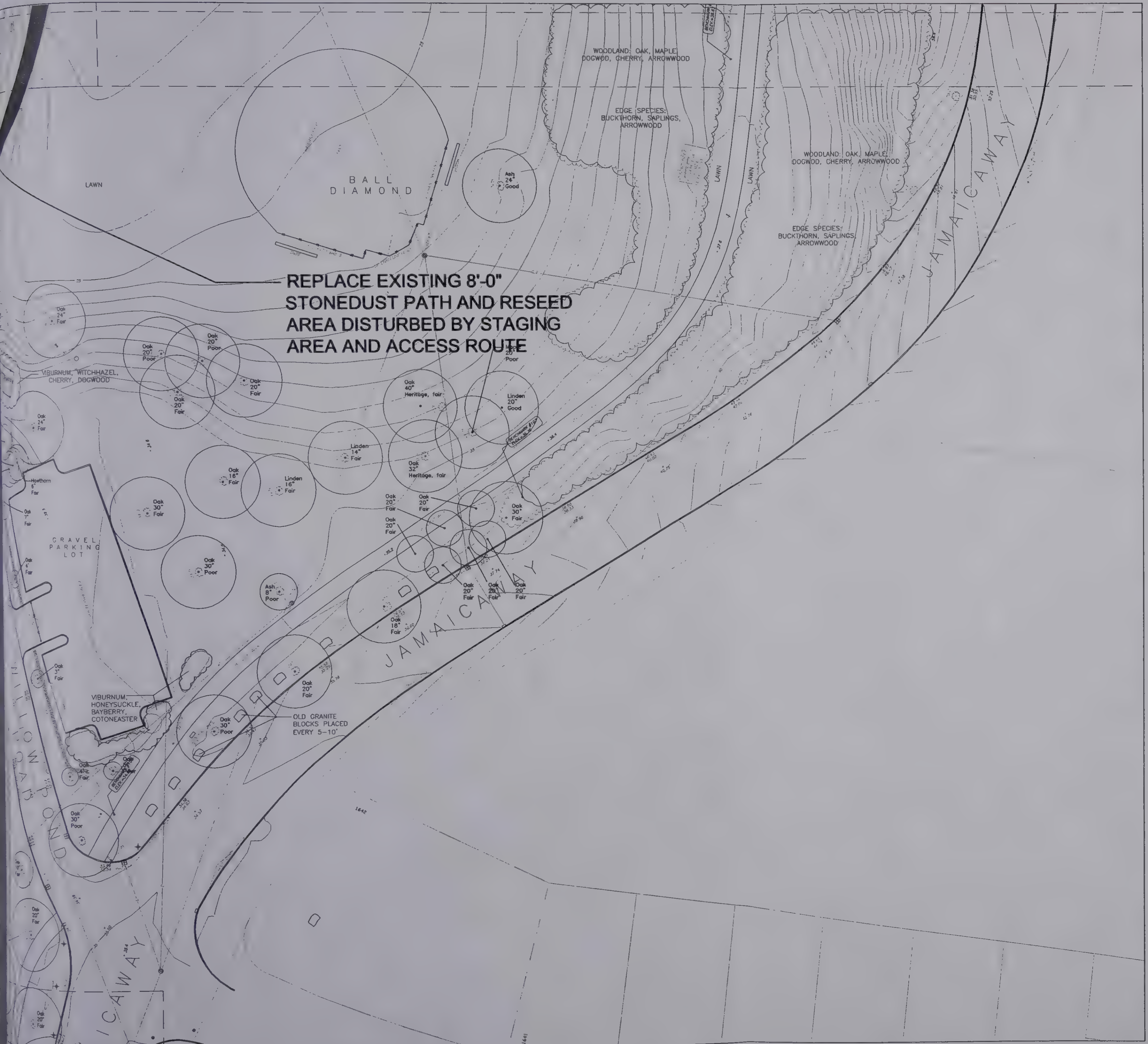
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L43



REPLACE EXISTING 8'-0" STONEDUST PATH AND RESEED AREA DISTURBED BY STAGING AREA AND ACCESS ROUTE

LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	⁓
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▩
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▧
NEW OR REPLACEMENT PATHS	■

NOTES

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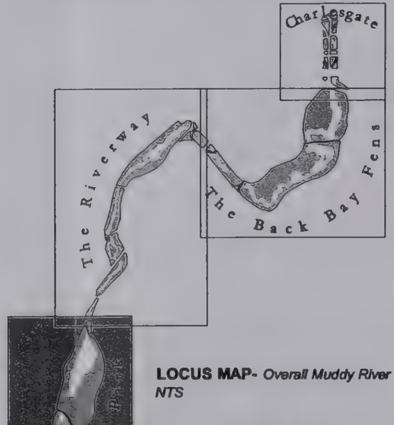

LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *Olmsted Park*
NTS

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY
DESIGN

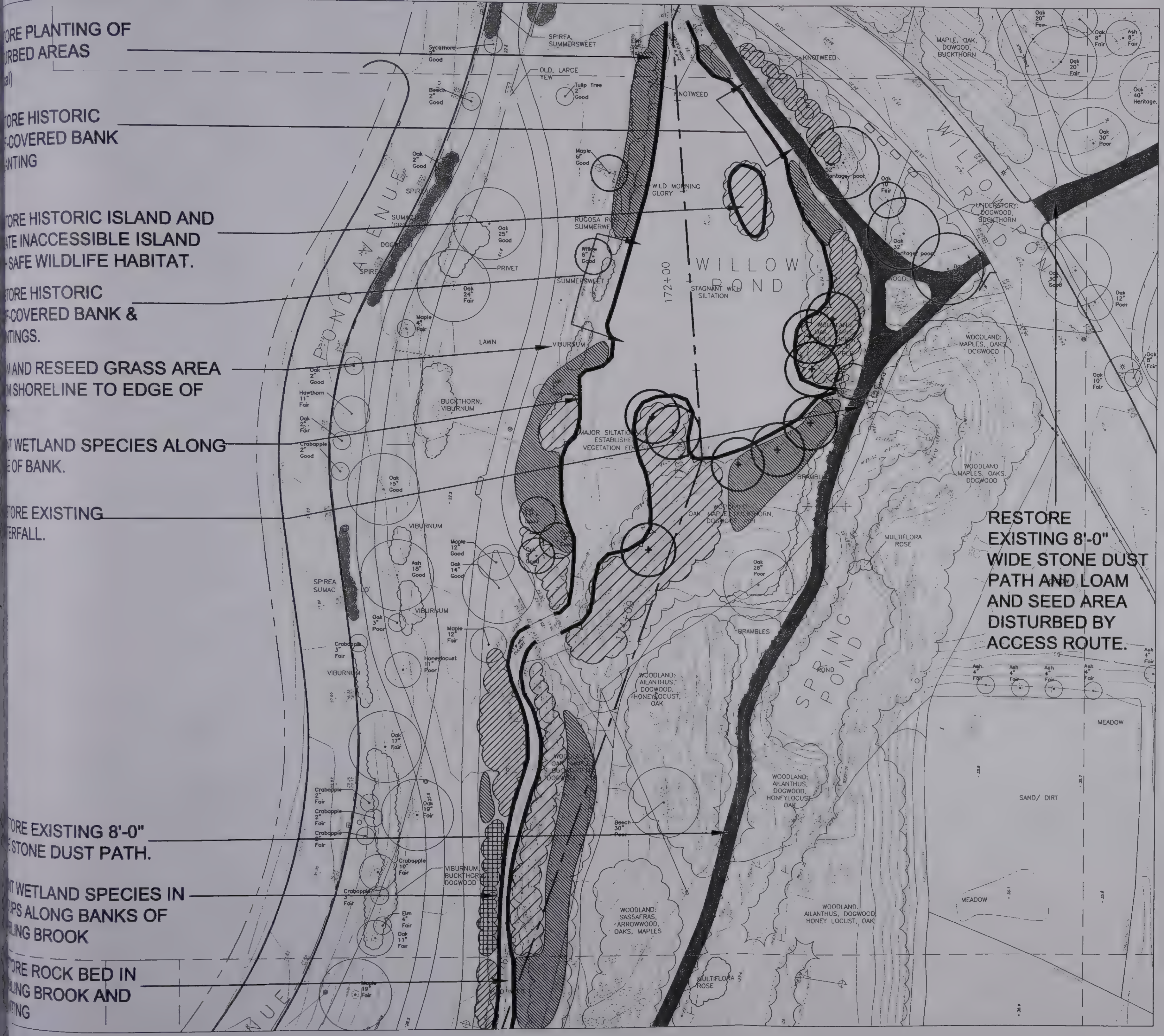
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY. MC/SF
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L44



LEGEND

- PROPOSED SHORELINE LOCATION
- EXISTING SHORELINE TO BE RETAINED
- EXISTING TREES TO BE RETAINED ⊙
- PROPOSED TREE PLANTING ⊕
- PERENNIAL PLANTING ▦
- LOW SHRUB PLANTING ▨
- MEDIUM SHRUB PLANTING ▨
- HIGH SHRUB PLANTING ▨
- NEW OR REPLACEMENT PATHS ■

NOTES

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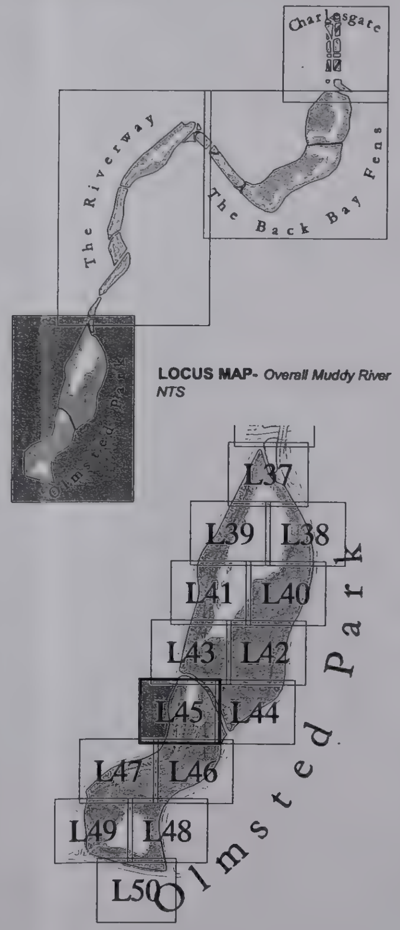

LOCUS MAP- *Overall Muddy River*
NTS

LOCUS MAP- *Olmsted Park*
NTS

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Boston and Brookline, Massachusetts

REVISIONS		
NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

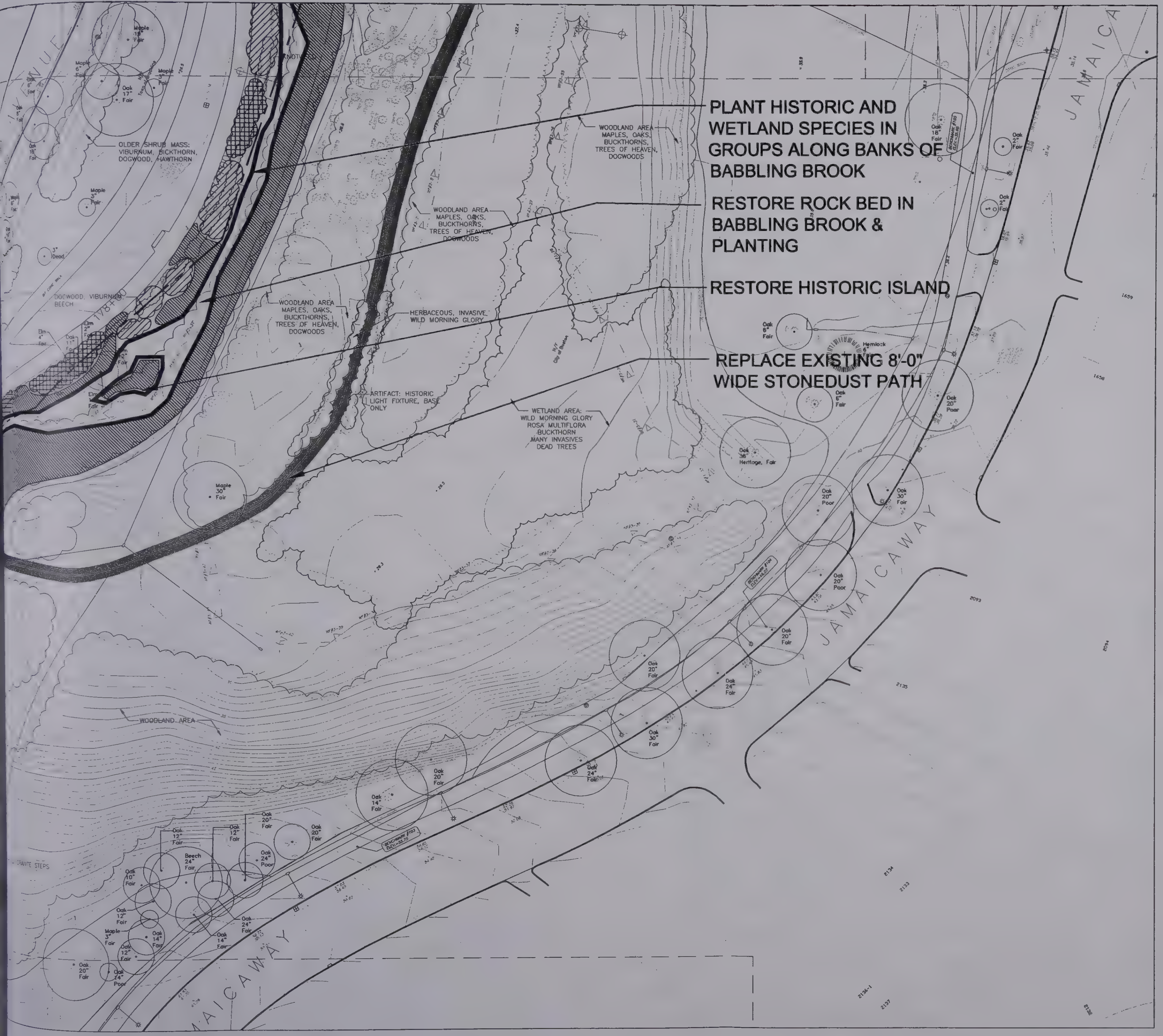
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: MC/SF
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L45


PLANT HISTORIC AND WETLAND SPECIES IN GROUPS ALONG BANKS OF BABBLING BROOK
RESTORE ROCK BED IN BABBLING BROOK & PLANTING
RESTORE HISTORIC ISLAND
REPLACE EXISTING 8'-0" WIDE STONEDUST PATH
OLDER SHRUB MASS: VIBURNUM, BUCKTHORN, DOGWOOD, HAWTHORN
WOODLAND AREA MAPLES, OAKS, BUCKTHORNS, TREES OF HEAVEN, DOGWOODS
HERBACEOUS, INVASIVE, WILD MORNING GLORY
ARTIFACT: HISTORIC LIGHT FIXTURE, BASE ONLY
WETLAND AREA: WILD MORNING GLORY ROSA MULTIFLORA BUCKTHORN MANY INVASIVES DEAD TREES
DOGWOOD, VIBURNUM BEECH
WOODLAND AREA
JAMAICA
JAMAICAWAY
JAMAICAWAY
JAMAICAWAY
Oak 36" Heritage, Fair
Hemlock
Maple 30" Fair
Beech 24" Fair

LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	- - -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

NOTES

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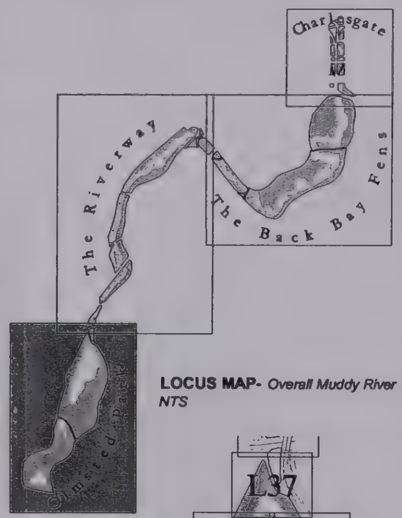
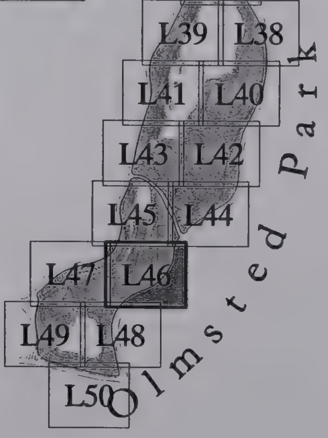
2) Appropriate wetland species to be planted along length of disturbed banks, to a width of 2'-0" (except where noted on drawings).



LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *Olmsted Park*
NTS

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO	DATE	REMARKS

DRAWING TITLE

PRELIMINARY DESIGN

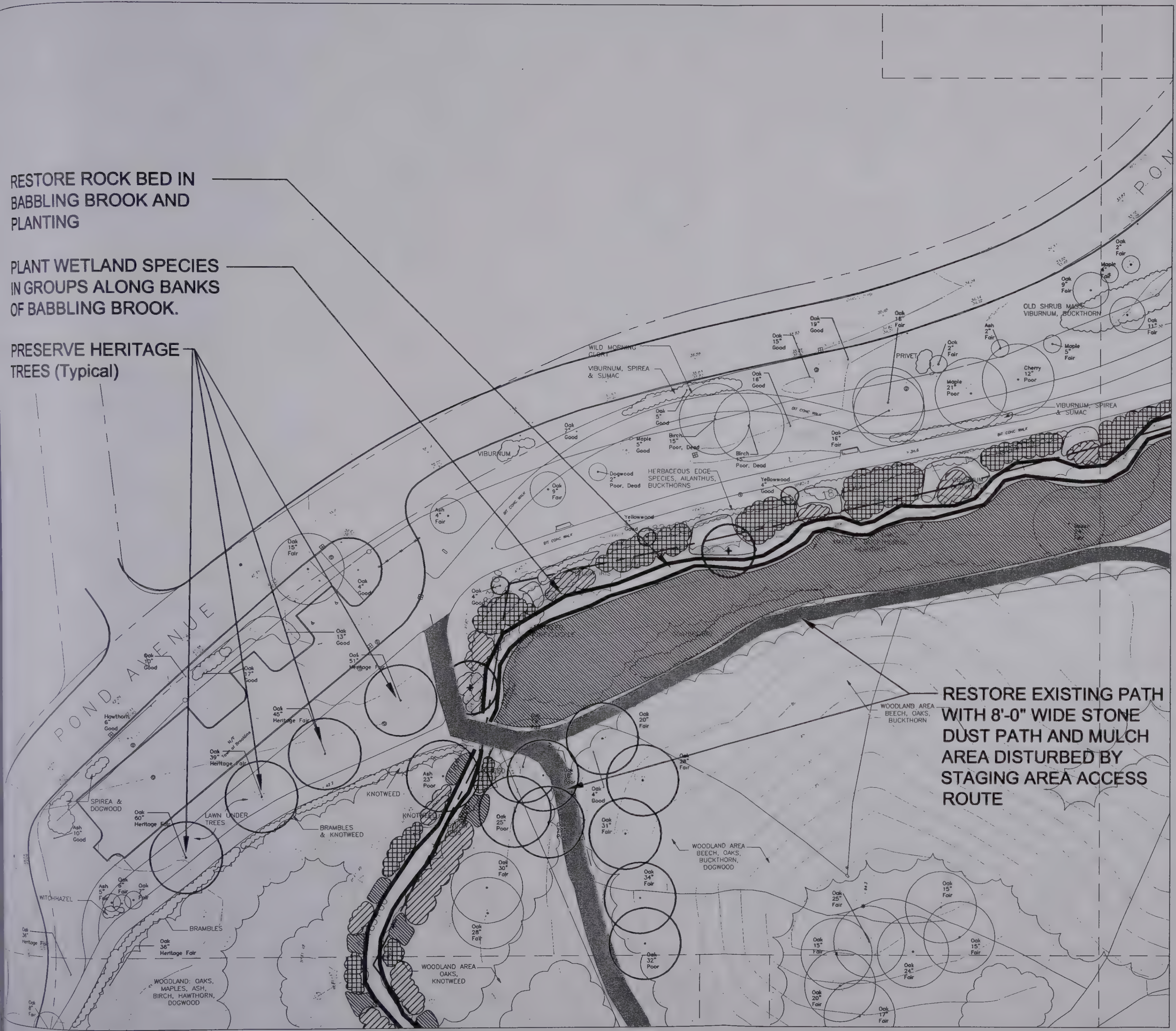
GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY: SF/MC
CHECKED BY: MP
DATE: 12/15/00
SCALE: 1"=60'

DRAWING NO.
L46



RESTORE ROCK BED IN BABBLING BROOK AND PLANTING

PLANT WETLAND SPECIES IN GROUPS ALONG BANKS OF BABBLING BROOK.

PRESERVE HERITAGE TREES (Typical)

RESTORE EXISTING PATH WITH 8'-0" WIDE STONE DUST PATH AND MULCH AREA DISTURBED BY STAGING AREA ACCESS ROUTE

LEGEND

PROPOSED SHORELINE LOCATION	～
EXISTING SHORELINE TO BE RETAINED	- - -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▧
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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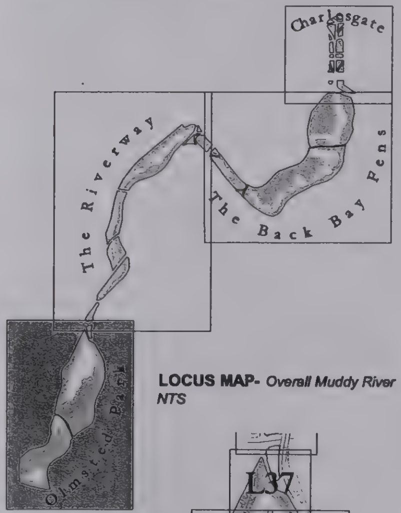
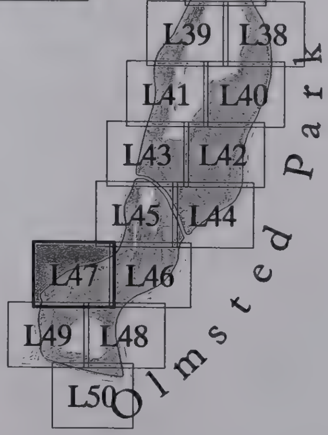


LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *Olmsted Park*
NTS

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Boston and Brookline, Massachusetts

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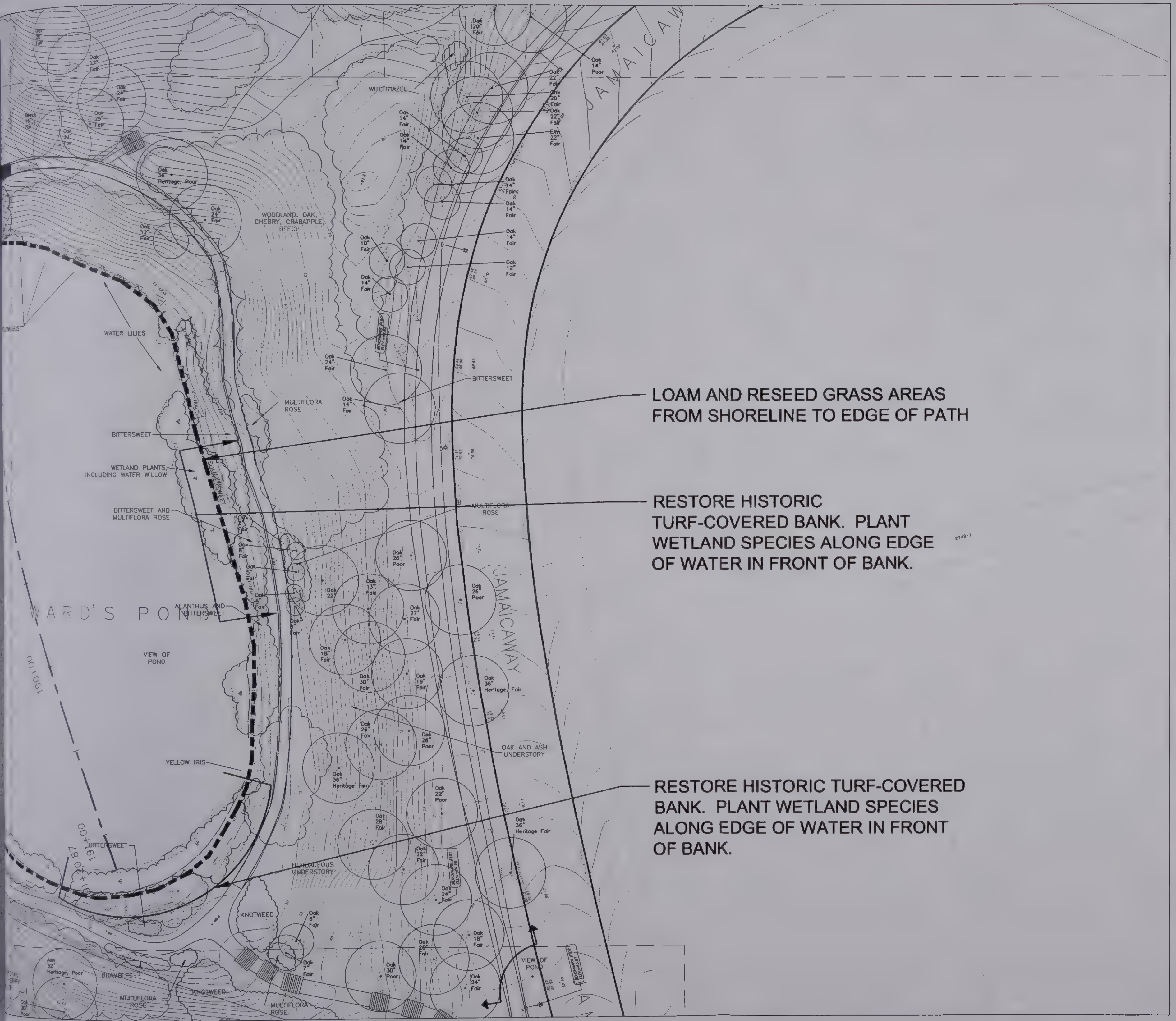
L47



LOAM AND RESEED GRASS AREAS FROM SHORELINE TO EDGE OF PATH

RESTORE HISTORIC TURF-COVERED BANK. PLANT WETLAND SPECIES ALONG EDGE OF WATER IN FRONT OF BANK.

RESTORE HISTORIC TURF-COVERED BANK. PLANT WETLAND SPECIES ALONG EDGE OF WATER IN FRONT OF BANK.

LEGEND

PROPOSED SHORELINE LOCATION	〜
EXISTING SHORELINE TO BE RETAINED	╍
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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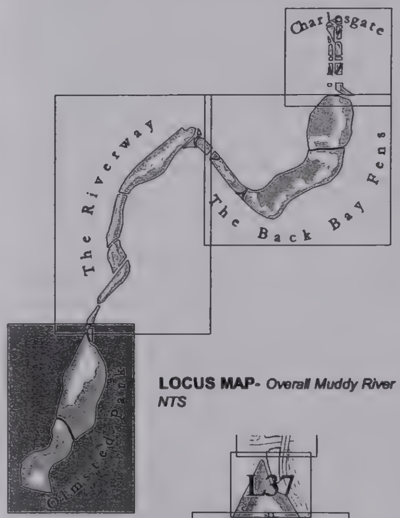

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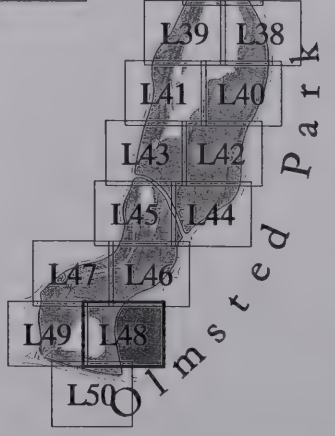
NTS



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20 0 20 40

SEAL

NORTH

DRAWN BY: SF/MC
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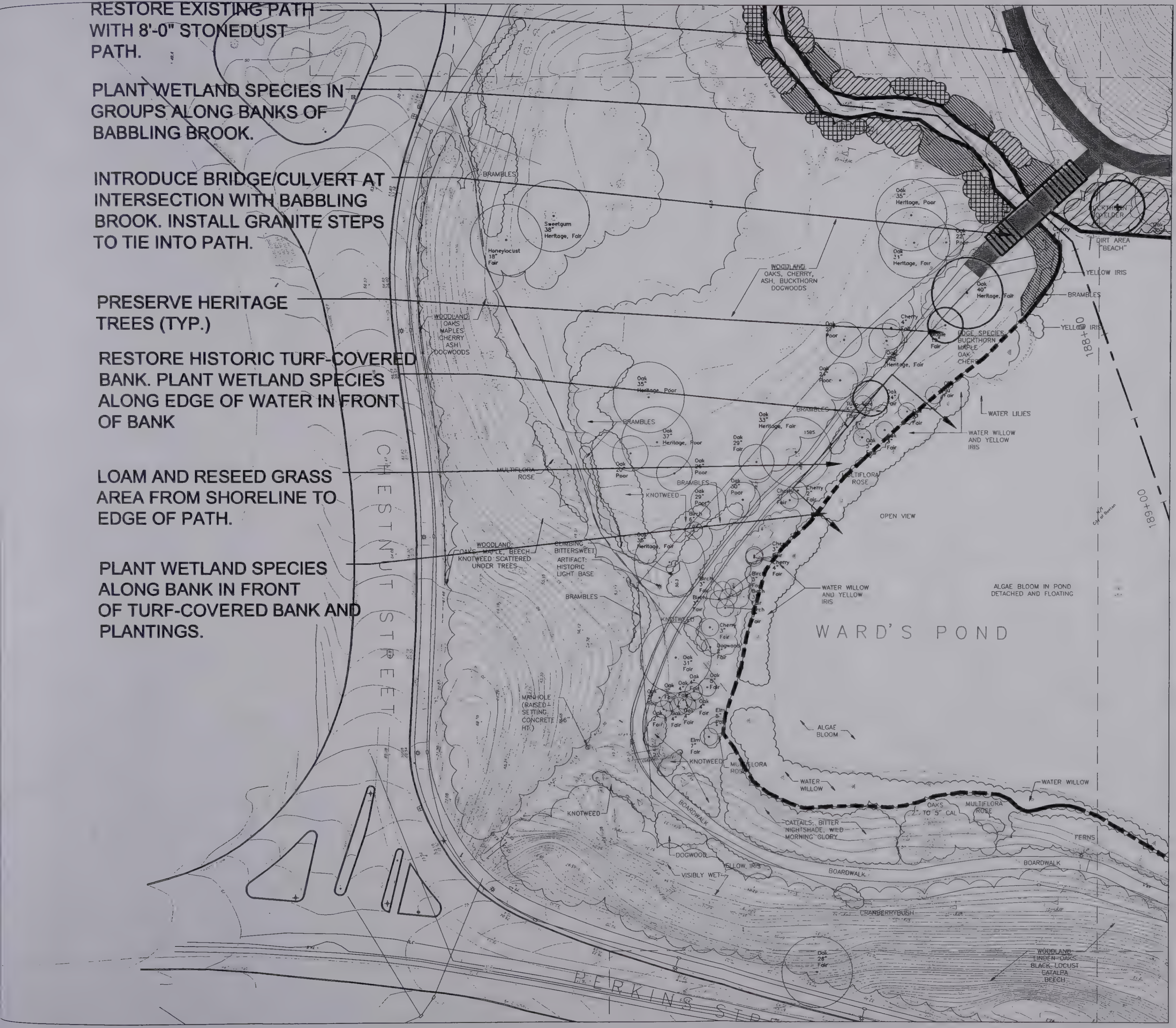
DATE: 15/12/00
SCALE. 1"=60'

DRAWING NO.
L48



RESTORE EXISTING PATH WITH 8'-0" STONEDUST PATH.

PLANT WETLAND SPECIES IN GROUPS ALONG BANKS OF BABBLING BROOK.

INTRODUCE BRIDGE/CULVERT AT INTERSECTION WITH BABBLING BROOK. INSTALL GRANITE STEPS TO TIE INTO PATH.

PRESERVE HERITAGE TREES (TYP.)

RESTORE HISTORIC TURF-COVERED BANK. PLANT WETLAND SPECIES ALONG EDGE OF WATER IN FRONT OF BANK

LOAM AND RESEED GRASS AREA FROM SHORELINE TO EDGE OF PATH.

PLANT WETLAND SPECIES ALONG BANK IN FRONT OF TURF-COVERED BANK AND PLANTINGS.

LEGEND

PROPOSED SHORELINE LOCATION	～
EXISTING SHORELINE TO BE RETAINED	- - -
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▧
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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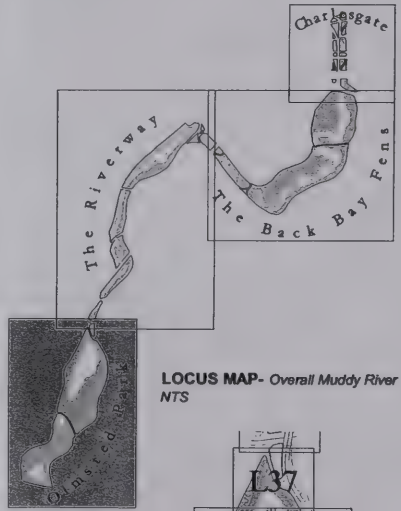

LOCUS MAP- *Overall Muddy River*
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LOCUS MAP- *Olmsted Park*
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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

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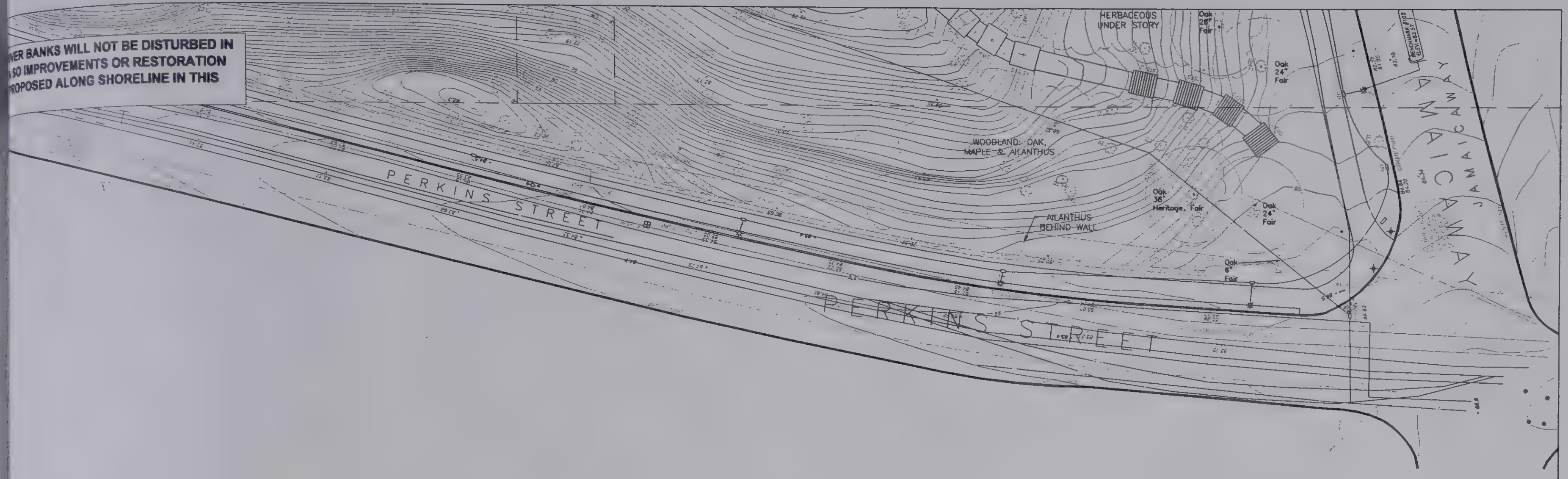

LEGEND

PROPOSED SHORELINE LOCATION	~
EXISTING SHORELINE TO BE RETAINED	⁓
EXISTING TREES TO BE RETAINED	⊙
PROPOSED TREE PLANTING	⊕
PERENNIAL PLANTING	▦
LOW SHRUB PLANTING	▨
MEDIUM SHRUB PLANTING	▨
HIGH SHRUB PLANTING	▨
NEW OR REPLACEMENT PATHS	■

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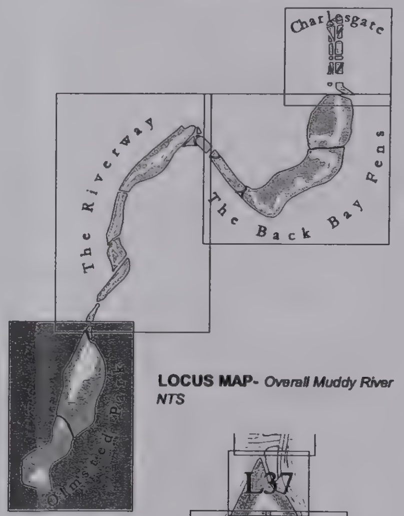
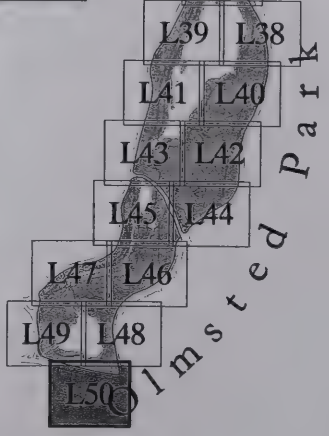


LOCUS MAP- *Overall Muddy River*
NTS



LOCUS MAP- *Olmsted Park*
NTS

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The Muddy River Restoration Project

Boston and Brookline, Massachusetts

REVISIONS

NO	DATE	REMARKS

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PRELIMINARY DESIGN

GRAPHIC SCALE
20 0 20 40

SEAL

NORTH

DRAWN BY. SF/MC
CHECKED BY· MP
DATE. 12/15/00
SCALE: 1"=60'

DRAWING NO.
L50

Appendix B

Test Boring Logs

DRESSER & McKEE

shire Street
e, MA 02139

Sheet 1 of 1

BOREHOLE LOG
SPL-SB-1

ston Parks & Recreation Deptment

cation: Boston, MA

Project Name: Muddy River Restoration

Project Number: 1517.28449.SR.SEDSAMP.FIELD

ntractor: Geotek Engineering, Inc.

ethod/Rig: HSA/Truck Mounted

Frank

te: Start: 7-28-00 **End:** 7-28-00

Coordinates:

Surface Elevation (ft.): 18 ±

Total Depth (ft.): 9

Depth to Initial Water Level (ft. BGS): NE

Abandonment Method: Backfilled

Field Screening Instrument: OVM

Logged By: Mike Bachand

ple ber	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
	24/8	0	0	7 9 31 11	▨		Moist, dense, brown/black, medium to fine SAND and gravel (Fill)
2	24/3	5	0	4 4 3 5	▨		Moist, loose, brown, medium to fine SAND and gravel, trace brick (Fill)
3	4/25		-	100/4"			Piece of concrete in spoon. Bottom of Exploration at 9.4FT.
		10					
		15					

EXPLANATION OF ABBREVIATIONS

ETHODS:
low Stem Auger
d Stem Auger
nd Auger
Rotary
al Tube Rotary
am Rotary
d Rotary
verse Circulation
ble Tool
ting
ving
l Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER.
AGS - Above Ground Surface

REMARKS

Auger Refusal @ 9FT.

Reviewed by: **Date:** 12/28/00

RESSER & McKEE

hire Street
e, MA 02139

Sheet 1 of 3

BOREHOLE LOG
SPL-SB-1A

ston Parks & Recreation Deptment

cation: Boston, MA

Project Name: Muddy River Restoration

Project Number: 1517.28449.SR.SEDSAMP.FIELD

ntractor: Geotek Engineering, Inc.

thod/Rig: HSA/Truck Mounted

rank

te: Start: 7-28-00 **End:** 7-28-00

Coordinates:

Surface Elevation (ft.): 18 ±

Total Depth (ft.): 59

Depth to Initial Water Level (ft. BGS): 8

Abandonment Method: Backfilled

Field Screening Instrument: OVM

Logged By: Mike Bachand

le er	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
		0			▨		Augered down to 9FT.
		5			▨		
3	24/0	10	-	18 10 10 7	▨		Fill from auger flights, wet, black/brown SAND and gravel, trace clay.
					▨		
4	24/3	15	-	2 2 2 2	▨		Wet loose, black/gray, coarse to fine SAND and GRAVEL, trace clay.
					▨		
				4 1	☰		Wet, soft, gray, Organic SILT

EXPLANATION OF ABBREVIATIONS

THODS:
ow Stem Auger
d Stem Auger
d Auger
Rotary
l Tube Rotary
m Rotary
d Rotary
erse Circulation
le Tool
ing
ing
Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Offset 15FT. south.
Smell of Creosote @ S-3

Reviewed by: **Date:** 12/28/00

CAMP DRESSER & McKEE

CDM

50 Hampshire Street
Cambridge, MA 02139

BOREHOLE LO
SPL-SB-1A

Client: Boston Parks & Recreation Deptment

Project Location: Boston, MA

Project Name: Muddy River Restora

Project Number: 1517.28449.SR.S

Sample Type	Sample Number	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
SS	S-5	24/12	20	-	2 2			Wet, medium stiff, gray, Organic SILT
SS	S-6	24/24	25	-	1 2 3 4			
SS	S-7	24/12	30	-	7 12 4 3			Wet, medium dense, gray, medium to fine SA
SS	S-8	24/16	35	-	3 5 9 20			Wet, medium dense, brown, coarse to fine SA
SS	S-9	24/21	40	-	7 19 42 58			Wet, medium dense, brown, medium to fine SA
SS	S-10	23/23	45	-	6 8 17 50/5"			Wet, medium dense, brown/tan, medium to fine
SS	S-11	22/21	50	-	16 27 48 50/4"			Wet, very dense, brown/tan, medium to fine SAN

RESSER & McKEE

M

ire Street
MA 02139

Sheet 3 of 3

BOREHOLE LOG

SPL-SB-1A

ton Parks & Recreation Deptment

ation: Boston, MA

Project Name: Muddy River Restoration

Project Number: 1517.28449.SR.SEDSAMP.FIELD

	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
	18/18	55	-	49 59 89			Wet, very dense, brown/tan, medium to fine SAND and gravel.
							Augered down to 59FT.
							Bottom of Exploration at 59FT.
		60					
		65					
		70					
		75					
		80					

RESSER & McKEE

M

ire Street
, MA 02139

Sheet 1 of 2

BOREHOLE LOG
SPL-SB-2

ton Parks & Recreation Deptment

ation: Boston, MA

Project Name: Muddy River Restoration

Project Number: 1517.28449.SR.SEDSAMP.FIELD

tractor: Geotek Engineering, Inc.

hod/Rig: HSA/Truck Mounted

ank

e: Start: 7-16-00 **End:** 7-17-00

oordinates:

Surface Elevation (ft.): 20 ±

Total Depth (ft.): 43

Depth to Initial Water Level (ft. BGS): 9

Abandonment Method: Backfilled

Field Screening Instrument: OVM

Logged By: Mike Bachand

e er	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
	24/6	0	0	3 8 12 10	▨		Moist, medium dense, dark brown, medium to fine SAND, trace gravel. (Fill)
					▨		
	24/9	5	0	2 5 7 15	▨		Moist to wet, medium dense, gray/dark brown, fine SAND, some clay and gravel. (Fill)
					▨		
	24/12	10	0	2 2 1 1	▨		Wet, loose, gray, medium to fine SAND, some clay, trace gravel. (Fill)
					▨		
	24/8	15	0	6 3 4 4	▤		Wet, stiff, dark gray/black, organic SILT.
					▤		
				4 3	▤		Wet, medium stiff, gray, organic SILT.

EXPLANATION OF ABBREVIATIONS

THODS:
w Stem Auger
Stem Auger
Auger
otary
Tube Rotary
n Rotary
Rotary
rse Circulation
e Tool
ng
ng
Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Reviewed by: Date: 12/28/00

CAMP DRESSER & McKEE

CDM

50 Hampshire Street
Cambridge, MA 02139

BOREHOLE LO
SPL-SB-2

Client: Boston Parks & Recreation Deptment

Project Location: Boston, MA

Project Name: Muddy River Restora

Project Number: 1517.28449.SR.SE

Sample Type	Sample Number	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
SS	S-5	24/24	20	0	3 6			
SS	S-6	24/24	25	0	5 4 5 6			S6-B Top 16" - Gray, organic SILT. S6-A Bottom 8" - Brown/gray PEAT.
SS	S-7	24/24	30	0	1 1 2 3			Wet, soft, gray, organic SILT.
SS	S-8	24/20	35	0	3 3 5 6			Wet, stiff, gray/blue, CLAY.
SS	U-9	24/24	40	0				Took Piston Sample from 39 - 41FT. Advanced
SS	S-10	10/8		0	7 79/4"			Wet, very stiff, blue/gray CLAY, some fine sand.
NR	S-11	0/0		0	50/0			
								Auger refusal at 43FT. Bottom of Exploration at 43FT.
			45					
			50					

DRESSER & McKEE

DM

shire Street
e, MA 02139

Sheet 1 of 2

BOREHOLE LOG
SPL-SB-3

ston Parks & Recreation Deptment	**Project Name:** Muddy River Restoration
cation: Boston, MA	**Project Number:** 1517.28449.SR.SEDSAMP.FIELD
ntractor: Geotek Engineering, Inc.	**Surface Elevation (ft.):** 15 ±
thod/Rig: HSA/Truck Mounted	**Total Depth (ft.):** 51
Frank	**Depth to Initial Water Level (ft. BGS):** 7
te: Start: 7-11-00 **End:** 7-11-00	**Abandonment Method:** Backfilled
Coordinates:	**Field Screening Instrument:** OVM
	Logged By: Mike Bachand

le ber	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
	24/18	0	0	8 31 50 63	▨		Dry, very dense, brown/tan, medium to fine SAND and gravel (Fill).
					▨		Boulder at 3 - 4FT.
	24/6	5	0	8 6 5 6	▨		Moist, medium dense, brown, coarse to fine Sand and gravel. (Fill)
					▨		
3	24/8	10	0	5 1/18"	▨		No recovery
A	24/0		0	3 3 3 7	▨		Wet, loose, gray, coarse SAND, some organics. (Fill)
					▨		
4	24/16	15	0	6 4 5 6	☰		Wet, stiff, dark gray/black, organic Silt and clay.
					☰		
				2 2	☰		Wet, medium stiff, gray, organic SILT and clay.

EXPLANATION OF ABBREVIATIONS

THODS:
ow Stem Auger
d Stem Auger
d Auger
Rotary
l Tube Rotary
m Rotary
Rotary
erse Circulation
le Tool
ing
ing
Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

No Safety Hammer used.-"Down the hole" hammer used.

Reviewed by: **Date:** 12/28/00

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CDM
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Cambridge, MA 02139

BOREHOLE LO

SPL-SB-3

Client: Boston Parks & Recreation Deptment
Project Location: Boston, MA

Project Name: Muddy River Restora
Project Number: 1517.28449.SR.SE

Sample Type	Sample Number	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
SS	S-5	24/24	20	0	3 6			
SS	S-6	24/24	25	0	2 2/12" 1			Wet, medium stiff, gray, organic SILT and cla
SS	S-7	24/10	30	0	5 3 10 12			Wet, stiff, gray, SILT, trace fine sand.
SS	S-8	24/22	35	0	6 12 22 13			Wet, dense, gray, fine SAND and SILT.
SS	S-9	24/22	40	0	2 3 4 5			Wet, medium stiff, gray/blue, CLAY, some silt.
SS	S-10	24/24	45	0	4 5 7 9			Wet, stiff, gray/blue, CLAY, trace silt.
SS	S-11	24/24	50	0	3 5 7 7			Wet, stiff, gray/blue, CLAY, trace silt.
								Bottom of Exploration at 51FT

DRESSER & McKEE

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ge, MA 02139

Sheet 1 of 2

BOREHOLE LOG
SPL-SB-4

oston Parks & Recreation Deptment

ocation: Boston, MA

Project Name: Muddy River Restoration

Project Number: 1517.28449.SR.SEDSAMP.FIELD

ontractor: Geotek Engineering, Inc.

ethod/Rig: HSA/Truck Mounted

Frank

ate: Start: 7-12-00 **End:** 7-12-00

Coordinates:

Surface Elevation (ft.): 17 ±

Total Depth (ft.): 51

Depth to Initial Water Level (ft. BGS): 7

Abandonment Method: Backfilled

Field Screening Instrument: OVM

Logged By: Mike Bachand

ple ber	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
1	9/5	0	0	8 50/3"	▨		Moist, Brown, medium to fine SAND, some gravel(Fill).
					▨		
-2	24/9	5	0	6 4 6 5	▨		Moist, stiff, brown/gray, SILT, some fine sand, trace gravel. (Fill)
					▨		
-3	24/5	10	0	7 2 2 3	▨		Wet, loose, brown, coarse to fine SAND and GRAVEL. (Fill)
					▨		
-4	20/20	15	0	21 20 43 50/2"	▨		Wet, dense, gray/black, coarse to medium SAND and GRAVEL. (Fill)
					▨		
				3 2			Wet, medium stiff, gray/black organic SILT, some clay.

EXPLANATION OF ABBREVIATIONS

ETHODS:
ollow Stem Auger
olid Stem Auger
and Auger
r Rotary
ual Tube Rotary
oam Rotary
ud Rotary
everse Circulation
able Tool
tting
riving
ill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Organic odor @ S-7

Reviewed by: **Date:** 12/28/00

CAMP DRESSER & McKEE

CDM

50 Hampshire Street
Cambridge, MA 02139

BOREHOLE LO
SPL-SB-4

Client: Boston Parks & Recreation Deptment

Project Location: Boston, MA

Project Name: Muddy River Restorati

Project Number: 1517.28449.SR.SE

Sample Type	Sample Number	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
SS	S-5	24/24	20	0	3 3	▤		
SS	S-6	24/24	25	0	5 5 6 5	▤		Wet, stiff, gray, organic SILT, some fine sand.
SS	S-7	24/20	30	0	15 14 17 19	▥		Wet, dense, gray, coarse to fine SAND, some
SS	S-8	24/24	35	0	10 12 11 20	▨		Wet, very stiff, gray, CLAY.
SS	S-9	24/24	40	0	11 16 18 20	▨		Wet, very stiff, gray, CLAY.
SS	S-10	24/24	45	0	4 5 6 6	▨		Wet, very stiff, gray, CLAY, some fine sand.
SS	S-11	24/24	50	0	13 20 15 26	▨		Wet, hard, gray/blue, CLAY.
								Bottom of exploration at 51FT.

DRESSER & McKEE

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Sheet 1 of 3

BOREHOLE LOG
SPL-SB-5

oston Parks & Recreation Deptment

Project Name: Muddy River Restoration

ocation: Boston, MA

Project Number: 1517.28449.SR.SEDSAMP.FIELD

ontractor: Geotek Engineering, Inc.

Surface Elevation (ft.): 18 ±

ethod/Rig: HSA/Truck Mounted

Total Depth (ft.): 56

Frank

Depth to Initial Water Level (ft. BGS): 10

ate: Start: 7-17-00 **End:** 7-17-00

Abandonment Method: Backfilled

Coordinates:

Field Screening Instrument: OVM

Logged By: Mike Bachand

ple ber	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
1	24/10	0	0	5 18 20 24	▨		Dry, dense, brown, medium to fine SAND and gravel (Fill).
					▨		
-2	24/3	5	0	6 7 5 5	▨		Dry, medium dense, brown, medium to fine SAND and gravel (Fill).
					▨		
-3	24/4	10	0	7 9 7 4	▨		Moist, medium dense, brown/tan, medium to fine SAND, some SILT, trace gravel. (Fill)
					▤		
-4	24/16	15	0	3 2 4 4	▤		Wet, medium stiff, organic SILT, some fine sand, trace gravel.
					⁂		
				11 9	⁂		Wet, very stiff, black/brown/gray, PEAT.

EXPLANATION OF ABBREVIATIONS

METHODS:
ollow Stem Auger
olid Stem Auger
and Auger
ir Rotary
ual Tube Rotary
oam Rotary
lud Rotary
everse Circulation
able Tool
etting
riving
rill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Reviewed by: **Date:** 12/28/00

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50 Hampshire Street
Cambridge, MA 02139

BOREHOLE LO
SPL-SB-5

Client: Boston Parks & Recreation Deptment
Project Location: Boston, MA
Project Name: Muddy River Restora
Project Number: 1517.28449.SR.SE

Sample Type	Sample Number	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
SS	S-5	24/24	20	0	9 9			
SS	S-6	24/22	25	0	2 2 6 9			Top 16" - PEAT. Bottom 6": Wet, stiff, light grayy, organic SILT
SS	S-7	24/24	30	0	5 8 11 9			Wet, stiff, green/gray, CLAY, some fine sand.
SS	S-8	24/16	35	0	5 7 9 11			Wet, stiff, green/gray, CLAY, some silt.
SS	S-9	24/24	40	0	3 4 5 6			Wet, stiff, blue/gray CLAY.
SS	S-10	24/24	45	0	2 2 3 5			Wet, medium stiff, blue/gray CLAY.
SS	S-11	24/24	50	0	3 4 5 6			Wet, stiff, blue/gray CLAY.

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e, MA 02139

Sheet 3 of 3

BOREHOLE LOG
SPL-SB-5

ston Parks & Recreation Deptment

cation: Boston, MA

Project Name: Muddy River Restoration

Project Number: 1517.28449.SR.SEDSAMP.FIELD

le er	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
					▨		Wet, stiff, blue/gray CLAY.
2	24/24	55	0	4 4 6 7	▨		
							Bottom of Exploration at 56FT.
		60					
		65					
		70					
		75					
		80					

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Sheet 1 of 3

BOREHOLE LOG
SPL-SB-6

ston Parks & Recreation Deptment

cation: Boston, MA

Project Name: Muddy River Restoration

Project Number: 1517.28449.SR.SEDSAMP.FIELD

ntractor: Geotek Engineering, Inc.

thod/Rig: HSA/Truck Mounted

rank

te: Start: 7-14-00 **End:** 7-14-00

Coordinates:

Surface Elevation (ft.): 17 ±

Total Depth (ft.): 56

Depth to Initial Water Level (ft. BGS): 10

Abandonment Method: Backfilled

Field Screening Instrument: OVM

Logged By: Mike Bachand

le er	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
	24/6	0	0	8 21 18 4	▨		Dry, dense, brown, medium to fine SAND, some gravel. (Fill)
					▨		
	24/4	5	0	11 8 3 2	▨		Dry, medium dense, brown, medium to fine SAND, some gravel. (Fill)
					▨		
3	24/1	10	-	22 25 10 5	▨		Wet, dense, brown/black, coarse sand and gravel. (Fill)
					▨		
4	24/10	15	-	WOH/24"	≡		Wet, brown/gray, very soft, organic SILT.
					≡		
				3 4	≡		Wet, brown/gray, stiff, organic SILT.

EXPLANATION OF ABBREVIATIONS

ETHODS:
low Stem Auger
id Stem Auger
nd Auger
Rotary
al Tube Rotary
am Rotary
d Rotary
verse Circulation
ble Tool
ting
ving
Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Reviewed by: [illegible] Date: 12/28/00

CAMP DRESSER & McKEE

CDM

50 Hampshire Street
Cambridge, MA 02139

BOREHOLE LO
SPL-SB-6

Client: Boston Parks & Recreation Deptment

Project Location: Boston, MA

Project Name: Muddy River Restora

Project Number: 1517.28449.SR.S

Sample Type	Sample Number	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
SS	S-5	24/.2	20	-	5 7	▤		
						▤		
NR	S-6	24/0	25	-	11 13 15 20	▤		No Recovery.
						▤		
SS	S-7	24/20	30	-	7 10 11 14	▥		Wet, very stiff, green/gray, SILT, some clay.
						▥		
SS	S-8	24/20	35	-	5 8 13 14	▨		Wet, very stiff, green/gray, CLAY, trace silt.
						▨		
SS	S-9	24/20	40	-	7 7 30 18	▨		Wet, hard, gray, CLAY, some fine sand.
						▨		
SS	S-10	24/20	45	0	2 3 4 8	▨		Wet, medium stiff, gray/blue, CLAY.
						▨		
SS	S-11	24/24	50	0	2 3 5 6	▨		Wet, medium stiff, gray/blue, CLAY.
						▨		

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Sheet 3 of 3

BOREHOLE LOG
SPL-SB-6

ston Parks & Recreation Deptment

cation: Boston, MA

Project Name: Muddy River Restoration

Project Number: 1517.28449.SR.SEDSAMP.FIELD

le er	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
					▨		
2	24/24	55	0	5 5 8 10	▨		Wet, stiff, gray/blue, CLAY.
		60 65 70 75 80					Bottom of Exploration at 56FT.

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M
shire Street
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Sheet 1 of 3

BOREHOLE LOG
SPL-SB-7

oston Parks & Recreation Deptment
ocation: Boston, MA
Project Name: Muddy River Restoration
Project Number: 1517.28449.SR.SEDSAMP.FIELD

ontractor: Geotek Engineering, Inc.
ethod/Rig: HSA/Truck Mounted
Frank
ate: Start: 7-18-00 **End:** 7-18-00
Coordinates:

Surface Elevation (ft.): 17 ±
Total Depth (ft.): 56
Depth to Initial Water Level (ft. BGS): 7
Abandonment Method: Backfilled
Field Screening Instrument: OVM
Logged By: Mike Bachand

ple ber	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
1	24/6	0	0	3 5 6 9			Moist, medium dense, brown, medium to fine SAND and gravel. (Fill)
-2	24/10	5	0	5 9 21 18			Top 6" - Moist, medium dense, brown, medium to fine SAND and gravel. (Fill) Bottom 4" - White, medium to fine SAND.
							Top 2" - Moist, medium dense, brown, medium to fine SAND and gravel. (Fill)
-3	24/18	10	0	3 1 2 3			Bottom 16" - Soft, brown/black, PEAT.
S-4	24/12	15	0	6 5 11 6			Top 4" - Brown/Black PEAT. Bottom 6" - Loose, brown/black, coarse to fine SAND and gravel, trace peat.
				2 2			Wet, medium stiff, gray, organic SILT.

EXPLANATION OF ABBREVIATIONS

METHODS:
ollow Stem Auger
olid Stem Auger
and Auger
ir Rotary
ual Tube Rotary
oam Rotary
lud Rotary
everse Circulation
able Tool
etting
riving
rill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Reviewed by: **Date:** 12/28/00

CAMP DRESSER & McKEE

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50 Hampshire Street
Cambridge, MA 02139

BOREHOLE LO

SPL-SB-7

Client: Boston Parks & Recreation Deptment

Project Location: Boston, MA

Project Name: Muddy River Restorati

Project Number: 1517.28449.SR.SE

Sample Type	Sample Number	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
SS	S-5	24/24	20	0	2 3	▤		
						▤		
SS	S-6	24/2	25	0	3 4 6 4	▤		Wet, gray/black, loose, coarse to fine SAND, sc
						▤		
SS	S-7	24/16	30	0	4 6 10 11	▨		Wet, gray/green, very stiff, CLAY, trace silt.
						▨		
SS	S-8	24/24	35	0	7 10 13 13	▨		Wet, green/gray, very stiff, CLAY, trace silt.
						▨		
SS	S-9	24/3	40	0	5 8 8 10	▨		Wet, green/gray, very stiff, CLAY, trace silt.
						▨		
SS	S-10	24/24	45	0	5 4 5 8	▨		Wet, stiff, gray, CLAY.
						▨		
SS	S-11	24/24	50	0	4 4 5 6	▨		Wet, stiff, gray, CLAY, trace silt.
						▨		

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Sheet 3 of 3

BOREHOLE LOG
SPL-SB-7

oston Parks & Recreation Deptment

ocation: Boston, MA

Project Name: Muddy River Restoration

Project Number: 1517.28449.SR.SEDSAMP.FIELD

ple ber	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
					▨		
12	24/24	55	0	8 10 12 14	▨		Wet, very stiff, gray, CLAY, trace gravel and silt.
							Bottom of Exploration at 56FT.
		60					
		65					
		70					
		75					
		80					

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e, MA 02139

Sheet 1 of 2

BOREHOLE LOG
EC-SB-1

ston Parks & Recreation Deptment

cation: Boston, MA

Project Name: Muddy River Restoration

Project Number: 1517.28449.SR.SEDSAMP.FIELD

ntractor: Geotek Engineering, Inc.

ethod/Rig: HSA/Truck Mounted

Frank

ate: Start: 7-19-00 **End:** 7-19-00

Coordinates:

Surface Elevation (ft.): 15 ±

Total Depth (ft.): 51

Depth to Initial Water Level (ft. BGS): 8

Abandonment Method: Backfilled

Field Screening Instrument: OVM

Logged By: Mike Bachand

ple ber	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
1	24/11	0	0	7 20 40 32	▨		Top 6" - Topsoil Moist, very dense, gray/brown, medium to fine SAND and gravel(Fill).
					▨		
-2	24/12	5	0	18 25 34 23	▨		Moist, very dense, gray/brown, medium to fine SAND and gravel(Fill).
					▨		
-3	24/6	10	0	9 10 9 10	▨		Moist, very dense, gray/brown, medium to fine SAND and gravel.
					▨		Top 6" - Wet, gray, coarse to fine SAND and gravel.
S-4	24/8	15	0	4 12 20 5	≡		Bottom 2" - Black, organic SILT
					≡		
				3 5	≡		Wet, stiff, gray, organic SILT.

EXPLANATION OF ABBREVIATIONS

METHODS:
ollow Stem Auger
olid Stem Auger
and Auger
ir Rotary
ual Tube Rotary
oam Rotary
ud Rotary
Reverse Circulation
Cable Tool
Jetting
Driving
Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Reviewed by: Date: 12/28/00

CAMP DRESSER & McKEE

CDM

50 Hampshire Street
Cambridge, MA 02139

BOREHOLE LO

EC-SB-1

Client: Boston Parks & Recreation Deptment

Project Location: Boston, MA

Project Name: Muddy River Restorati

Project Number: 1517.28449.SR.SE

Sample Type	Sample Number	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
SS	S-5	24/24	20	0	7 5			
SS	S-6	24/12	25	0	3 4 15 26			Top 18" - Medium stiff, organic SILT. Bottom 2" - Dense, gray/black, coarse to fine S
SS	S-7	24/18	30	0	7 11 11 15			Wet, very stiff, green/gray CLAY, some silt.
SS	S-8	24/20	35	0	7 6 10 11			Wet, very stiff, green/gray CLAY, some silt.
SS	S-9	24/26	40	0	3 4 4 6			Wet, medium stiff, blue/gray CLAY.
SS	S-10	24/22	45	0	2 3 4 5			Wet, medium stiff, blue/gray, CLAY.
SS	S-11	24/24	50	0	4 4 6 6			Wet, stiff, blue/gray, CLAY.
								Bottom of Exploration at 51FT.

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Sheet 1 of 1

BOREHOLE LOG
EC-SB-2

Boston Parks & Recreation Deptment

Location: Boston, MA

Project Name: Muddy River Restoration

Project Number: 1517.28449.SR.SEDSAMP.FIELD

Contractor: Geotek Engineering, Inc.

Method/Rig: HSA/Truck Mounted

Frank

Date: Start: 7-21-00 **End:** 7-21-00

e Coordinates:

Surface Elevation (ft.): 16 ±

Total Depth (ft.): 12

Depth to Initial Water Level (ft. BGS): 9

Abandonment Method: Backfilled

Field Screening Instrument: OVM

Logged By: Mike Bachand

mple nber	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
-1	24/8	0	0	15 9 25 18	▨		Moist, dense, brown, medium to fine SAND and gravel. (Fill)
					▨		
-2	24/6	5	0	8 6 8 6	▨		Moist, medium dense, brown, medium to fine SAND and gravel. (Fill)
					▨		
S-3	17/2	10	0	8 3 50/5"	▨		Wet, very dense, gray, coarse to fine SAND and gravel.
							Bottom of Exploration at 12"
		15					

EXPLANATION OF ABBREVIATIONS

METHODS:
Hollow Stem Auger
Solid Stem Auger
Hand Auger
Air Rotary
Dual Tube Rotary
Foam Rotary
Mud Rotary
Reverse Circulation
Cable Tool
Jetting
Driving
Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Auger Refusal @ 12FT.

Reviewed by: Date: 12/28/00

CAMP DRESSER & McKEE
CDM
50 Hampshire Street
Cambridge, MA 02139

BOREHOLE LO
EC-SB-2A

Client: Boston Parks & Recreation Deptment
Project Location: Boston, MA

Project Name: Muddy River Restor
Project Number: 1517.28449.SR.S

Drilling Contractor: Geotek Engineering, Inc.
Drilling Method/Rig: HSA/Truck Mounted
Drillers: Frank
Drilling Date: **Start:** 7-24-00 **End:** 7-24-00
Borehole Coordinates:
N E

Surface Elevation (ft.): 16 ±
Total Depth (ft.): 10
Depth to Initial Water Level (ft. BGS)
Abandonment Method: Backfilled
Field Screening Instrument: OVM
Logged By: Mike Bachand

Sample Type	Sample Number	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
			0			▨		Fill (No Samples Taken, Augered Down)
			5			▨		
			10					
			15					

EXPLANATION OF ABBREVIATIONS

DRILLING METHODS:

HSA	Hollow Stem Auger
SSA	Solid Stem Auger
HA	Hand Auger
AR	Air Rotary
DTR	Dual Tube Rotary
FR	Foam Rotary
MR	Mud Rotary
RC	Reverse Circulation
CT	Cable Tool
JET	Jetting
D	Driving
DTC	Drill Through Casing

SAMPLING TYPES:

AS	Auger/Grab Sample
CS	California Sampler
BX	1.5" Rock Core
NX	2.1" Rock Core
GP	Geoprobe
HP	Hydro Punch
SS	Split Spoon
ST	Shelby Tube
WS	Wash Sample
OTHER:	
AGS	Above Ground Surface

REMARKS

Augered Down, No Samples Taken.

Auger Refusal @ 10.

Reviewed by:

DRESSER & McKEE

DM

shire Street
je, MA 02139

Sheet 1 of 1

BOREHOLE LOG
EC-SB-2B

bston Parks & Recreation Deptment	**Project Name:** Muddy River Restoration
ocation: Boston, MA	**Project Number:** 1517.28449.SR.SEDSAMP.FIELD
ontractor: Geotek Engineering, Inc.	**Surface Elevation (ft.):** 16 ±
ethod/Rig: HSA/Truck Mounted	**Total Depth (ft.):** 16.5
Frank	**Depth to Initial Water Level (ft. BGS):** 9
ate: Start: 7-24-00 **End:** 7-24-00	**Abandonment Method:** Backfilled
Coordinates:	**Field Screening Instrument:** OVM
	Logged By: Mike Bachand

ple ber	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
-1	24/8	0	0	3 11 7 8	▨		Moist, medium dense, brown, medium to fine SAND and gravel. (Fill)
					▨		
-2	24/10	5	0	12 11 10 14	▨		Moist, medium dense, brown, medium to fine SAND and gravel. (Fill)
					▨		
S-3	24/2	10	0	7 21 13 11	▨		Wet, dense, brown/gray, medium to fine SAND and gravel, some clay. (Fill)
					▨		Hard drilling at 13.5FT.
		15			▨		Augers kicked out and made hole twice as big. Offset 10FT N of EC-SB2.
							Bottom of Exploration at 16.5FT

EXPLANATION OF ABBREVIATIONS

METHODS:
- Hollow Stem Auger
- Solid Stem Auger
- Hand Auger
- Air Rotary
- Dual Tube Rotary
- Foam Rotary
- Mud Rotary
- Reverse Circulation
- Cable Tool
- Jetting
- Driving
- Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Hard Drilling at 13.5FT.
At 16FT BGS, augers walked along bottom and opened hole up to about 1.5FT in diameter. Very hard at 16.5FT.
Offset 10FT. north.

Reviewed by: Date: 10/26/00

DRESSER & McKEE

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e, MA 02139

Sheet 1 of 2

BOREHOLE LOG
EC-SB-2C

oston Parks & Recreation Deptment
ocation: Boston, MA

Project Name: Muddy River Restoration
Project Number: 1517.28449.SR.SEDSAMP.FIELD

ontractor: Geotek Engineering, Inc.
ethod/Rig: HSA/Truck Mounted
Frank
ate: Start: 8-1-00 **End:** 8-1-00
Coordinates:

Surface Elevation (ft.): 16 ±
Total Depth (ft.): 46
Depth to Initial Water Level (ft. BGS): 9
Abandonment Method: Backfilled
Field Screening Instrument: OVM
Logged By: Mike Bachand

ple ber	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
1	24/8	0		4 9 7 8	▨		Moist, medium dense, brown/tan, fine SAND, some silt, trace cobble. (Fill)
					▨		
-2	24/16	5		10 16 12 7	▨		Moist, medium dense, light brown, medium to fine SAND, some gravel. (Fill)
					▨		
-3	24/0	10		9 7 5 6	▨		Piece of wood and gravel in spoon. (Fill)
					▨		
S-4	24/10	15		8 9 8 6	▨		Wet, medium dense, gray, coarse to medium SAND and gravel. (Fill)
					▨		

EXPLANATION OF ABBREVIATIONS

METHODS:
Hollow Stem Auger
Solid Stem Auger
Hand Auger
Air Rotary
Dual Tube Rotary
Foam Rotary
Mud Rotary
Reverse Circulation
Cable Tool
Jetting
Driving
Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Offset 30FT. west of EC-SB2
Organic Odor @ S-7

Reviewed by: Date: 12/28/00

CAMP DRESSER & McKEE
CDM
50 Hampshire Street
Cambridge, MA 02139

BOREHOLE LO
EC-SB-2C

Client: Boston Parks & Recreation Deptment
Project Location: Boston, MA

Project Name: Muddy River Resto
Project Number: 1517.28449.SR.S

Sample Type	Sample Number	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
SS	S-5	24/24	20		2 2 3 3			Wet, medium stiff, gray, organic SILT.
SS	S-6	24/21	25		2 2 2 3			Wet, medium stiff, gray, organic SILT.
SS	S-7	24/23	30		2 2 9 11			Top 12" - Wet, medium stiff, gray, organic SIL Bottom 11" - Wet, medium dense, gray, fine
SS	S-8	24/24	35		22 14 27 73			Top 20"- Wet, very dense, gray, medium to fin odor. Bottom 4" - Wet, hard, gray, CLAY
SS	S-9	24/24	40		10 9 12 13			Wet, very stiff, green/gray, CLAY, trace silt.
SS	S-10	24/24	45		4 5 6 10			Wet, stiff, green/gray, CLAY.
			50					Bottom of Exploration at 46FT.

DRESSER & McKEE

M

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e, MA 02139

Sheet 1 of 3

BOREHOLE LOG
EC-SB-3

ston Parks & Recreation Deptment

cation: Boston, MA

Project Name: Muddy River Restoration

Project Number: 1517.28449.SR.SEDSAMP.FIELD

ontractor: Geotek Engineering, Inc.

ethod/Rig: HSA/Truck Mounted

Frank

ate: Start: 7-25-00 **End:** 7-25-00

Coordinates:

Surface Elevation (ft.): 18 ±

Total Depth (ft.): 73

Depth to Initial Water Level (ft. BGS): 9

Abandonment Method: Backfilled

Field Screening Instrument: OVM

Logged By: Mike Bachand

ple ber	Sample Recovery (Inches)	Elev. / Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
1	24/12	0	0	5 12 19 35			Moist, dense, dark brown, medium to fine SAND and gravel. (Fill)
-2	24/7	5	0	10 12 7 7			Moist, medium dense, dark brown, medium to fine SAND and gravel. (Fill)
-3	24/14	10	0	1 1/12" 1			Wet, very loose, dark brown, organic SILT, some medium to fine sand, trace gravel.
S-4	24/9	15	0	9 9 4 4			Wet, medium dense, dark brown/gray, coarse SAND and gravel.
				1 2			Wet, very loose, gray, organic SILT.

EXPLANATION OF ABBREVIATIONS

METHODS:
Hollow Stem Auger
Solid Stem Auger
Hand Auger
Air Rotary
Dual Tube Rotary
Foam Rotary
Mud Rotary
Reverse Circulation
Cable Tool
Jetting
Driving
Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Reviewed by: **Date:** 12/18/00

CAMP DRESSER & McKEE

CDM

50 Hampshire Street
Cambridge, MA 02139

BOREHOLE LO
EC-SB-3

Client: Boston Parks & Recreation Deptment
Project Location: Boston, MA

Project Name: Muddy River Restorati
Project Number: 1517.28449.SR.SEI

Sample Type	Sample Number	Sample Recovery (Inches)	Elev. / Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
SS	S-5	24/24	20	0	1 2			
SS	S-6	24/24	25	0	2 2 4 3			Wet, medium stiff, gray, organic SILT.
SS	S-7	24/24	30	0	2 2 2 4			Wet, medium stiff, gray, organic SILT.
SS	S-8	24/24	35	0	4 14 17 8			8A, Top 22" - Wet, gray, very stiff, organic SILT, fine SAND.
								8B, Bottom 2" - Wet Gray/green, CLAY.
SS	S-9	24/24	40	0	10 11 15 19			Wet, very stiff, green/gray, CLAY, trace fine sand
SS	S-10	24/24	45	0	4 6 7 10			Wet, stiff, green/gray, CLAY.
SS	S-11	24/24	50	0	4 5 10 12			Wet, stiff, green/gray, CLAY trace gravel.

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ge, MA 02139

Sheet 3 of 3

BOREHOLE LOG
EC-SB-3

oston Parks & Recreation Deptment

ocation: Boston, MA

Project Name: Muddy River Restoration

Project Number: 1517.28449.SR.SEDSAMP.FIELD

ple ber	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
					▨		
12	24/24	55	0	5 7 7 8	▨		Wet, stiff, green/gray, CLAY trace gravel.
					▨		
-13	24/4	60	0	8 8 6 6	▨		Wet, stiff, green/gray, CLAY trace gravel.
					▨		
-14	24/24	65	0	3 4 4 5	▨		Wet, medium stiff, blue/gray, some fine sand.
					▨		
-15	24/24		0	4 5 6 6	▨		Wet, stiff, blue/gray, CLAY, trace fine sand.
-16	24/18	70	0		▨		Piston Tube
S-17	24/24		0	5 2 17 20	▨		Top 12" - Wet, stiff, blue/gray, CLAY, trace fine sand. Bottom 6" - Wet, medium dense, gray, fine SAND.
		75					Bottom of Exploration at 73FT.
		80					

DRESSER & McKEE

pshire Street
ige, MA 02139

Sheet 1 of 3

BOREHOLE LOG
EC-SB-4

oston Parks & Recreation Deptment

ocation: Boston, MA

ontractor: Geotek Engineering, Inc.

ethod/Rig: HSA/Truck Mounted

Frank

ate: Start: 7-26-00 End: 7-26-00

Coordinates:

Project Name: Muddy River Restoration

Project Number: 1517.28449.SR.SEDSAMP.FIELD

Surface Elevation (ft.): 20 ±

Total Depth (ft.): 76

Depth to Initial Water Level (ft. BGS): 5

Abandonment Method: Backfilled

Field Screening Instrument: OVM

Logged By: Mike Bachand

mple nber	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
S-1	24/12	0	0	8 14 17 32	▨		Moist, dense, tan, medium to fine SAND and gravel. (Fill)
					▨		
S-2	24/7	5	0	3 4 4 10	▨		Wet, loose, tan/brown, coarse to fine SAND and gravel. (Fill)
					▨		
S-3	24/9	10	0	4 4 5 5	▨		Wet, loose, tan/brown, coarse to fine SAND and gravel. (Fill)
					▨		
S-4	24/3	15	0	4 1 1 2	▨		Wet, very loose, tan/brown, coarse to fine SAND and gravel. (Fill)
					▨		
				2 1	▨		Top 6" - Wet, very loose, tan/brown, coarse to fine SAND and

EXPLANATION OF ABBREVIATIONS

METHODS:
Hollow Stem Auger
Solid Stem Auger
Hand Auger
Air Rotary
Dual Tube Rotary
Foam Rotary
Mud Rotary
Reverse Circulation
Cable Tool
Jetting
Driving
Drill Through Casing

SAMPLING TYPES:
AS - Auger/Grab Sample
CS - California Sampler
BX - 1.5" Rock Core
NX - 2.1" Rock Core
GP - Geoprobe
HP - Hydro Punch
SS - Split Spoon
ST - Shelby Tube
WS - Wash Sample
OTHER:
AGS - Above Ground Surface

REMARKS

Reviewed by: Date: 12/28/00

CAMP DRESSER & McKEE
CDM
50 Hampshire Street
Cambridge, MA 02139

BOREHOLE LO
EC-SB-4

Client: Boston Parks & Recreation Deptment
Project Location: Boston, MA

Project Name: Muddy River Restorat
Project Number: 1517.28449.SR.SEI

Sample Type	Sample Number	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
SS	S-5	24/18	20	0	2 2			gravel. (Fill) Bottom 12" - Wet, soft, gray, organic SILT.
SS	S-6	24/24	25	0	1 1 2 3			Wet, soft, gray, organic SILT.
SS	S-7	24/24	30	0	1 1 2 3			Wet, soft, gray, organic SILT.
SS	S-8	24/24	35	0	2 1 2 3			Wet, soft, gray, organic SILT.
SS	S-9	24/24	40	0	4 7 17 20			Wet, very stiff, green/gray, CLAY.
SS	S-10	24/24	45	0	8 10 13 18			Wet, very stiff, green/gray, CLAY.
SS	S-11	24/24	50	0	3 4 5 8			Wet, stiff, green/gray, CLAY.

DRESSER & McKEE

M

shire Street
ge, MA 02139

Sheet 3 of 3

BOREHOLE LOG
EC-SB-4

oston Parks & Recreation Deptment

ocation: Boston, MA

Project Name: Muddy River Restoration

Project Number: 1517.28449.SR.SEDSAMP.FIELD

ple ber	Sample Recovery (Inches)	Elev. Depth (ft.)	Field Instrument Reading (ppm)	Blows per 6 Inches	Graphic Log	Stratum Designation	Material Description
					▨		
12	24/8	55	0	12 8 12 18	▨		Wet, very stiff, green/gray, CLAY.
					▨		
-13	24/16	60	0	20 8 8 8	▨		Wet, very stiff, green/gray, CLAY, trace gravel.
					▨		
-14	24/22	65	0	13 7 7 7	▨		Wet, very stiff, green/gray, CLAY, trace gravel.
					▨		
S-15	24/24	70	0	3 2 3 5	▨		Wet, medium stiff, blue/gray CLAY.
					▨		
S-16	24/24	75	0	9 4 6 7	▨		Top 14" - Wet, medium stiff, blue/gray CLAY. Medium - 6" - Wet, blue/gray, fine SAND. Bottom 6" - Wet, medium stiff, blue/gray CLAY.
		80					Bottom of Exploration at 76FT.

Appendix C

Laboratory Test Results

CDM Jessberger
Geotechnical Engineering Laboratory

Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

lient: Boston Parks & Recreation Dept.
roject Name: Muddy River
roject Location: Boston, MA
roject Number: 1517-28449-PRELDN.CONCPTDN.GEOTECH
ample Number: SPL-SB-1
ample Date: 7/28/00
ample Location: S-6
ab ID Number: 907

Tested By: SC
Test Date: 9/28/00
Procedure: C
Temperature: 440 °C

AS RECEIVED MOISTURE CONTENT	
Tin Dish Identity	LO
Tin Weight (g)	9.2
Wet Weight of Sample & Tin (g)	73.1
Dry Weight of Sample & Tin (g)	50.1
Weight of Water (g)	23.0
Weight of Dry Soil (g)	40.9
Moisture Content (%)	56.2

ASH CONTENT	
Porcelain Dish Identity	K
Porcelain Dish Weight (g)	18.6
Porcelain Dish + Oven Dried Soil (g)	35.1
Weight of Oven Dried Soil (g)	16.5
Weight of Dish & Burned Soil (g)	33.5
Weight of Burned Soil (g)	14.9
Weight of Organic Material (g)	1.6
Ash Content (%)	90.1

Organic Content, (%)

9.9

CDM Jessberger
Geotechnical Engineering Laboratory

Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

Client:	Boston Parks & Recreation Dept.
Project Name:	Muddy River
Project Location:	Boston, MA
Project Number:	1517-28449-PRELDN.CONCPTDN.GEOTECH
Sample Number:	SPL-SB-2
Sample Date:	7/11/00
Sample Location:	S-6A
Lab ID Number:	909

Tested By: S
Test Date: 9/28

Procedure: C
Temperature: 440

AS RECEIVED MOISTURE CONTENT	
Tin Dish Identity	PO
Tin Weight (g)	7.9
Wet Weight of Sample & Tin (g)	74.9
Dry Weight of Sample & Tin (g)	36.6
Weight of Water (g)	38.4
Weight of Dry Soil (g)	28.6
Moisture Content (%)	134.1

ASH CONTENT	
Porcelain Dish Identity	T1
Porcelain Dish Weight (g)	19.5
Porcelain Dish + Oven Dried Soil (g)	33.6
Weight of Oven Dried Soil (g)	14.1
Weight of Dish & Burned Soil (g)	30.9
Weight of Burned Soil (g)	11.4
Weight of Organic Material (g)	2.7
Ash Content (%)	80.9

Organic Content, (%)

19.1

CDM Jessberger
Geotechnical Engineering Laboratory

Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

lient: Boston Parks & Recreation Dept.
roject Name: Muddy River
roject Location: Boston, MA
roject Number: 1517-28449-PRELDN.CONCPTDN.GEOTECH
ample Number: SPL-SB-2
ample Date: 7/11/00
ample Location: S-7
ab ID Number: 910

Tested By: SC
Test Date: 9/28/00
Procedure: C
Temperature: 440 °C

AS RECEIVED MOISTURE CONTENT	
Tin Dish Identity	TR1
Tin Weight (g)	9.1
Wet Weight of Sample & Tin (g)	86.5
Dry Weight of Sample & Tin (g)	49.5
Weight of Water (g)	37.1
Weight of Dry Soil (g)	40.3
Moisture Content (%)	91.9

ASH CONTENT	
Porcelain Dish Identity	T
Porcelain Dish Weight (g)	19.1
Porcelain Dish + Oven Dried Soil (g)	34.9
Weight of Oven Dried Soil (g)	15.9
Weight of Dish & Burned Soil (g)	32.9
Weight of Burned Soil (g)	13.9
Weight of Organic Material (g)	2.0
Ash Content (%)	87.3

Organic Content, (%)

12.7

CDM Jessberger
Geotechnical Engineering Laboratory

Standard Test Method for Moisture, Ash, and Organic Matter of Peat an Other Organic Soils(ASTM D2974)

Client: Boston Parks & Recreation Dept.
Project Name: Muddy River
Project Location: Boston, MA
Project Number: 1517-28449-PRELDN.CONCPTDN.GEOTECH
Sample Number: SPL-SB-3
Sample Date: 7/12/00
Sample Location: S-6
Lab ID Number: 913

Tested By:
Test Date: 1
Procedure:
Temperature: 4

AS RECEIVED MOISTURE CONTENT	
Tin Dish Identity	KP5
Tin Weight (g)	9.2
Wet Weight of Sample & Tin (g)	115.0
Dry Weight of Sample & Tin (g)	80.5
Weight of Water (g)	34.5
Weight of Dry Soil (g)	71.2
Moisture Content (%)	48.5

ASH CONTENT	
Porcelain Dish Identity	A
Porcelain Dish Weight (g)	19.4
Porcelain Dish + Oven Dried Soil (g)	38.9
Weight of Oven Dried Soil (g)	19.5
Weight of Dish & Burned Soil (g)	38.3
Weight of Burned Soil (g)	18.8
Weight of Organic Material (g)	0.7
Ash Content (%)	96.6

Organic Content, (%)

3.4

CDM Jessberger
Geotechnical Engineering Laboratory

Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

lient: Boston Parks & Recreation Dept.
roject Name: Muddy River
roject Location: Boston, MA
roject Number: 1517-28449-PRELDN.CONCPTDN.GEOTECH
ample Number: SPL-SB-4
ample Date: 7/12/00
ample Location: S-6
ab ID Number: 917

Tested By: SC
Test Date: 10/2/00
Procedure: C
Temperature: 440 °C

AS RECEIVED MOISTURE CONTENT	
Tin Dish Identity	P
Tin Weight (g)	8.0
Wet Weight of Sample & Tin (g)	89.9
Dry Weight of Sample & Tin (g)	64.5
Weight of Water (g)	25.4
Weight of Dry Soil (g)	56.6
Moisture Content (%)	44.9

ASH CONTENT	
Porcelain Dish Identity	C
Porcelain Dish Weight (g)	17.8
Porcelain Dish + Oven Dried Soil (g)	37.5
Weight of Oven Dried Soil (g)	19.7
Weight of Dish & Burned Soil (g)	36.9
Weight of Burned Soil (g)	19.1
Weight of Organic Material (g)	0.5
Ash Content (%)	97.3

Organic Content, (%)

2.7

CDM Jessberger
Geotechnical Engineering Laboratory

Standard Test Method for Moisture, Ash, and Organic Matter of Peat an Other Organic Soils(ASTM D2974)

Client: Boston Parks & Recreation Dept.
Project Name: Muddy River
Project Location: Boston, MA
Project Number: 1517-28449-PRELDN.CONCPTDN.GEOTECH
Sample Number: EC-SB-4
Sample Date: 7/26/00
Sample Location: S-8
Lab ID Number: 929

Tested By:
Test Date: 10
Procedure:
Temperature: 44

AS RECEIVED MOISTURE CONTENT	
Tin Dish Identity	FS
Tin Weight (g)	9.3
Wet Weight of Sample & Tin (g)	71.1
Dry Weight of Sample & Tin (g)	46.9
Weight of Water (g)	24.2
Weight of Dry Soil (g)	37.7
Moisture Content (%)	64.2

ASH CONTENT	
Porcelain Dish Identity	XX
Porcelain Dish Weight (g)	18.1
Porcelain Dish + Oven Dried Soil (g)	35.5
Weight of Oven Dried Soil (g)	17.4
Weight of Dish & Burned Soil (g)	34.4
Weight of Burned Soil (g)	16.2
Weight of Organic Material (g)	1.1
Ash Content (%)	93.4

Organic Content, (%)

6.6

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Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

ient:	Boston Parks & Recreation Dept.		
oject Name:	Muddy River	Tested By:	SC
		Test Date:	10/2/00
oject Location:	Boston, MA		
oject Number:	1517-28449-PRELDN.CONCPTDN.GEOTECH	Procedure:	C
ample Number:	SPL-SB-5	Temperature:	440 °C
ample Date:	7/18/00		
ample Location:	S-5		
ab ID Number:	918		

AS RECEIVED MOISTURE CONTENT	
Tin Dish Identity	H3
Tin Weight (g)	9.2
Wet Weight of Sample & Tin (g)	88.6
Dry Weight of Sample & Tin (g)	52.7
Weight of Water (g)	35.9
Weight of Dry Soil (g)	43.6
Moisture Content (%)	82.4

ASH CONTENT	
Porcelain Dish Identity	D
Porcelain Dish Weight (g)	17.3
Porcelain Dish + Oven Dried Soil (g)	33.7
Weight of Oven Dried Soil (g)	16.4
Weight of Dish & Burned Soil (g)	31.5
Weight of Burned Soil (g)	14.2
Weight of Organic Material (g)	2.2
Ash Content (%)	86.8

Organic Content, (%)

13.2

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Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

Client: Boston Parks & Recreation Dept.
Project Name: Muddy River
Project Location: Boston, MA
Project Number: 1517-28449-PRELDN.CONCPTDN.GEOTECH
Sample Number: SPL-SB-5
Sample Date: 7/18/00
Sample Location: S-6
Lab ID Number: 919

Tested By: S
Test Date: 10/
Procedure: (
Temperature: 440

AS RECEIVED MOISTURE CONTENT	
Tin Dish Identity	Q3
Tin Weight (g)	9.3
Wet Weight of Sample & Tin (g)	99.3
Dry Weight of Sample & Tin (g)	83.3
Weight of Water (g)	16.0
Weight of Dry Soil (g)	74.0
Moisture Content (%)	21.6

ASH CONTENT	
Porcelain Dish Identity	T
Porcelain Dish Weight (g)	19.1
Porcelain Dish + Oven Dried Soil (g)	43.8
Weight of Oven Dried Soil (g)	24.8
Weight of Dish & Burned Soil (g)	43.7
Weight of Burned Soil (g)	24.7
Weight of Organic Material (g)	0.1
Ash Content (%)	99.6

Organic Content, (%)

0.4

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Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

lient: Boston Parks & Recreation Dept.
roject Name: Muddy River
roject Location: Boston, MA
roject Number: 1517-28449-PRELDN.CONCPTDN.GEOTECH
ample Number: SPL-SB-7
ample Date: 7/18/00
ample Location: S-3
ab ID Number: 933

Tested By: SC
Test Date: 10/2/00

Procedure: C
Temperature: 440 °C

AS RECEIVED MOISTURE CONTENT	
Tin Dish Identity	MO
Tin Weight (g)	9.3
Wet Weight of Sample & Tin (g)	73.9
Dry Weight of Sample & Tin (g)	37.4
Weight of Water (g)	36.5
Weight of Dry Soil (g)	28.1
Moisture Content (%)	129.7

ASH CONTENT	
Porcelain Dish Identity	T1
Porcelain Dish Weight (g)	19.5
Porcelain Dish + Oven Dried Soil (g)	32.8
Weight of Oven Dried Soil (g)	13.3
Weight of Dish & Burned Soil (g)	30.1
Weight of Burned Soil (g)	10.6
Weight of Organic Material (g)	2.7
Ash Content (%)	79.5

Organic Content, (%)

20.5

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Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

Client: Boston Parks & Recreation Dept.
Project Name: Muddy River
Project Location: Boston, MA
Project Number: 1517-28449-PRELDN.CONCPTDN.GEOTECH
Sample Number: EC-SB-1
Sample Date: 7/19/00
Sample Location: S-5
Lab ID Number: 937

Tested By: S
Test Date: 10/2
Procedure: C
Temperature: 440

AS RECEIVED MOISTURE CONTENT	
Tin Dish Identity	A10
Tin Weight (g)	9.2
Wet Weight of Sample & Tin (g)	101.8
Dry Weight of Sample & Tin (g)	79.3
Weight of Water (g)	22.6
Weight of Dry Soil (g)	70.1
Moisture Content (%)	32.2

ASH CONTENT	
Porcelain Dish Identity	K
Porcelain Dish Weight (g)	18.6
Porcelain Dish + Oven Dried Soil (g)	39.6
Weight of Oven Dried Soil (g)	21.0
Weight of Dish & Burned Soil (g)	39.1
Weight of Burned Soil (g)	20.5
Weight of Organic Material (g)	0.4
Ash Content (%)	98.0

Organic Content, (%)

2.0

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Standard Test Method for Moisture, Ash, and Organic Matter of Peat and Other Organic Soils(ASTM D2974)

ient: Boston Parks & Recreation Dept.
oject Name: Muddy River
oject Location: Boston, MA
oject Number: 1517-28449-PRELDN.CONCPTDN.GEOTECH
ample Number: EC-SB-3
ample Date: 7/25/00
ample Location: S-6
ab ID Number: 925

Tested By: SC
Test Date: 10/2/00
Procedure: C
Temperature: 440 °C

AS RECEIVED MOISTURE CONTENT	
Tin Dish Identity	GE20
Tin Weight (g)	9.3
Wet Weight of Sample & Tin (g)	94.1
Dry Weight of Sample & Tin (g)	64.0
Weight of Water (g)	30.1
Weight of Dry Soil (g)	54.6
Moisture Content (%)	55.1

ASH CONTENT	
Porcelain Dish Identity	B
Porcelain Dish Weight (g)	18.6
Porcelain Dish + Oven Dried Soil (g)	37.4
Weight of Oven Dried Soil (g)	18.8
Weight of Dish & Burned Soil (g)	36.6
Weight of Burned Soil (g)	18.0
Weight of Organic Material (g)	0.8
Ash Content (%)	95.9

Organic Content, (%)

4.1

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Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

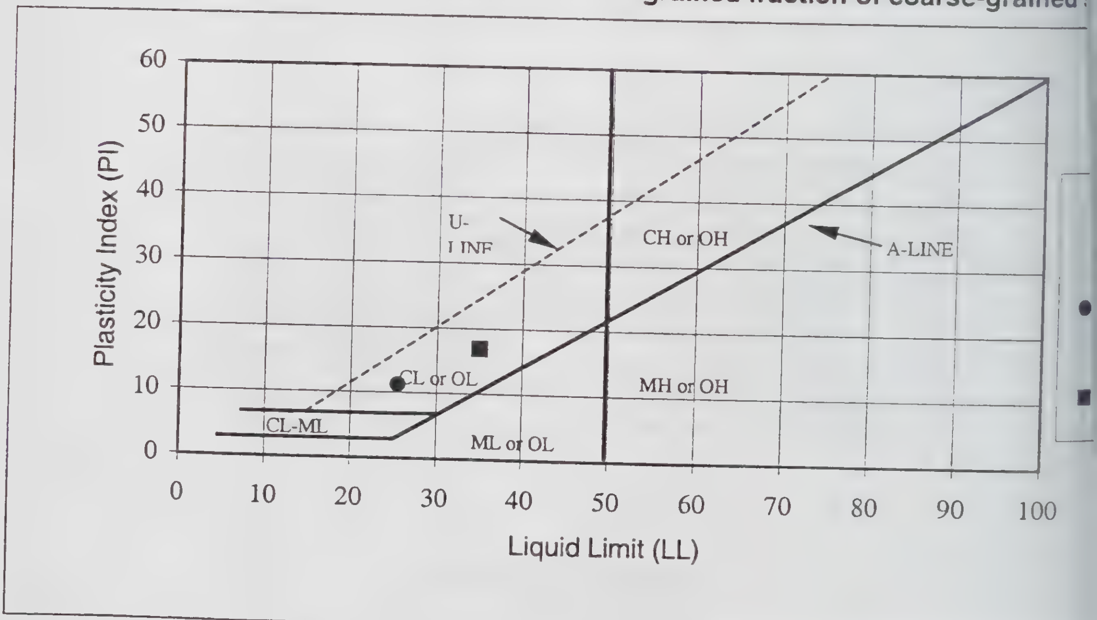
Client: Boston Parks & Recreation Dept.
Project Name: Muddy River
Project Location: Boston, MA
Project Number: 1517-28449-PRELDN.CONCPTDN.GEOTECH

Results

Test Number:	1	2
Sample Number:	SPL-SB-2	SPL-SB-3
Sample Location:	S-10	S-7
Lab ID Number:	911	914
Tested By:	AJV	AJV
Test Date:	10/4/00	10/4/00
Sample Depth (ft):	41-42	29-31
As Rec'd Water Cont. (%):	21.2	24.5
Liquid Limit (LL)	25	35
Plastic Limit (PL)	14	18
Plasticity Index (PI)	11	17

Plasticity Chart

For classification of fine-grained soils and fine-grained fraction of coarse-grained



Reference: ASTM D 2487

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Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

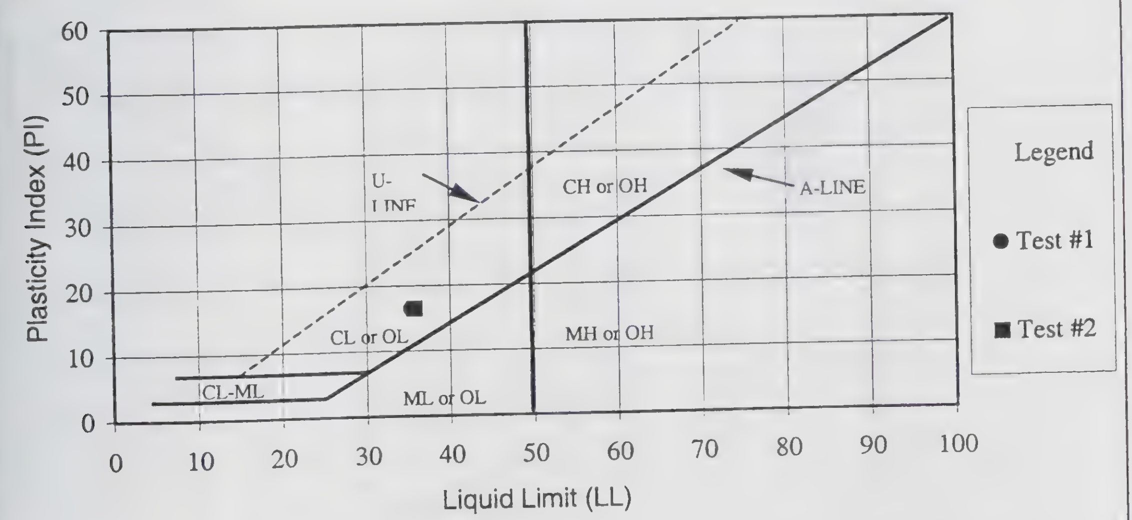
Client: Boston Parks & Recreation Dept.
Project Name: Muddy River
Project Location: Boston, MA
Project Number: 1517-28449-PRELDN.CONCPTDN.GEOTECH

Results

Test Number:	1	2
Sample Number:	SPL-SB-5	SPL-SB-5
Sample Location:	S-8	S-10
Lab ID Number:	920	921
Tested By:	AJV	AJV
Test Date:	10/3/00	10/3/00
Sample Depth (ft):	34-36	44-46
As Rec'd Water Cont. (%):	26.4	25.5
Liquid Limit (LL)	35	36
Plastic Limit (PL)	19	19
Plasticity Index (PI)	16	17

sticity Chart

r classification of fine-grained soils and fine-grained fraction of coarse-grained soils.



Reference: ASTM D 2487

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Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

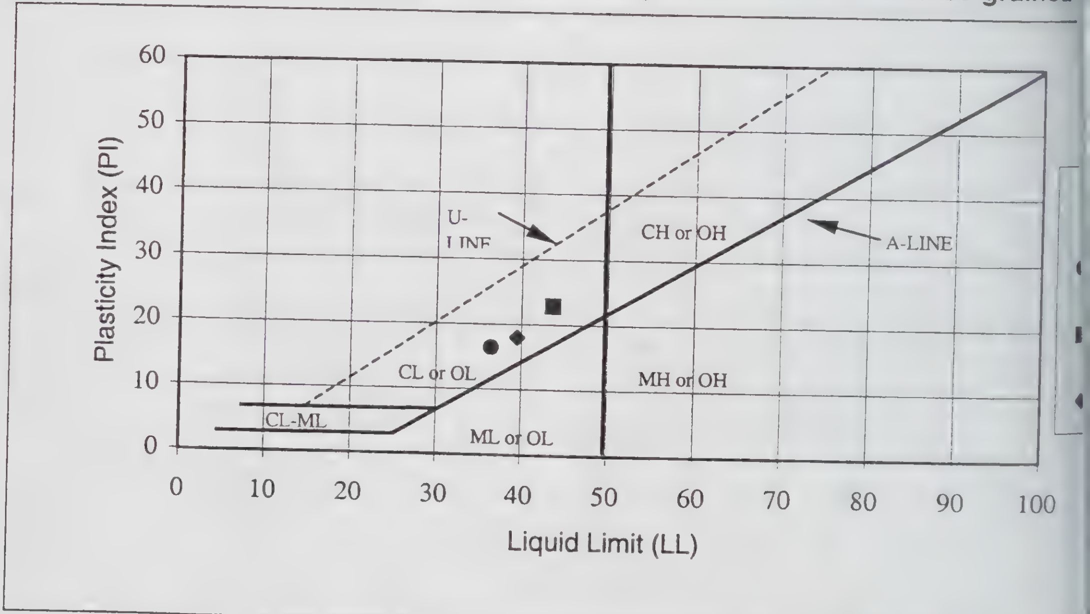
Client: Boston Parks & Recreation Dept.
Project Name: Muddy River
Project Location: Boston, MA
Project Number: 1517-28449-PRELDN.CONCPTDN.GEOTECH

Results

Test Number:	**1**	**2**	**3**
Sample Number:	SPL-SB-6	SPL-SB-6	SPL-SB-7
Sample Location:	S-7	S-12	S-7
Lab ID Number:	930	931	934
Tested By:	AJV	AJV	AJV
Test Date:	10/3/00	10/3/00	10/4/00
Sample Depth (ft):	29-31	54-56	---
As Rec'd Water Cont. (%):	23.1	28.0	26.2
Liquid Limit (LL)	36	44	39
Plastic Limit (PL)	20	21	21
Plasticity Index (PI)	16	23	18

Plasticity Chart

For classification of fine-grained soils and fine-grained fraction of coarse-grained



Reference: ASTM D 2487

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Liquid Limit, Plastic Limit and Plasticity Index of Soils (ASTM D4318)

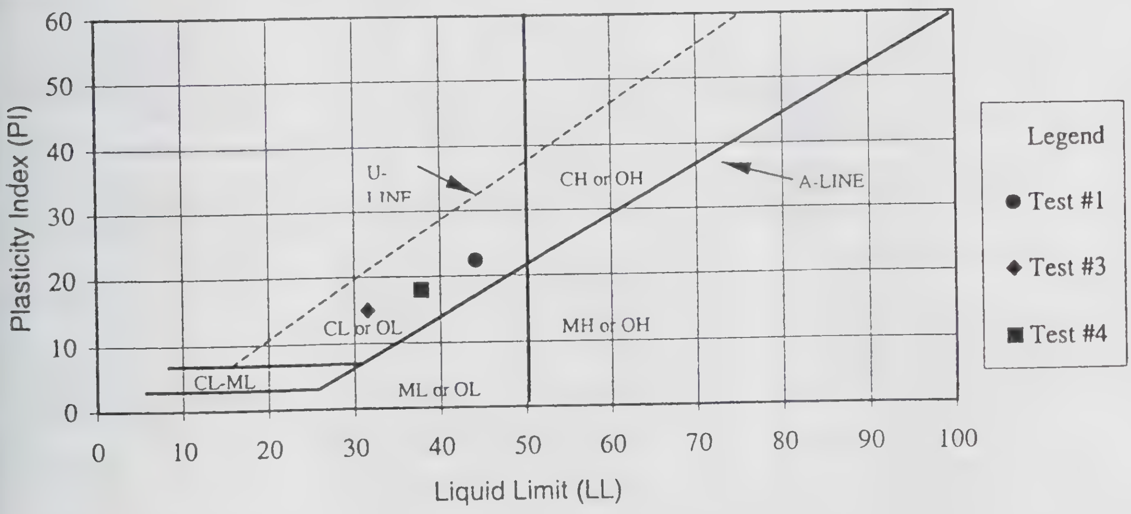
Client: Boston Parks & Recreation Dept.
Project Name: Muddy River
Project Location: Boston, MA
Project Number: 1517-28449-PRELDN.CONCPTDN.GEOTECH

Results

Test Number:	1	2	3	4
Sample Number:	EC-SB-3	EC-SB-3	EC-SB-4	EC-SB-4
Sample Location:	S-10	S-17	S-14	S-11
Lab ID Number:	923	924	927	928
Tested By:	AJV	AJV	AJV	AJV
Test Date:	10/2/00	10/2/00	10/2/00	10/2/00
Sample Depth (ft):	44-46	71-73	64-66	49-51
As Rec'd Water Cont. (%):	28.7	20.3	32.8	22.0
Liquid Limit (LL)	44	NP	32	38
Plastic Limit (PL)	22	NP	17	20
Plasticity Index (PI)	22	NP	15	18

ticity Chart

classification of fine-grained soils and fine-grained fraction of coarse-grained soils.



Reference: ASTM D 2487

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Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (ASTM D2488)

Client: Boston Parks & Recreation Department

Project Name: Muddy River Restoration

Project Location: Boston, MA

Project Number: 1517-28449-PRELDN.CONCPTDN.GEOTECH

Results

Sample Number:	**SPL-SB-1**	**SPL-SB-2**	**SPL-SB-2**	**SPL-S**
Sample Location:	**S-6**	**S-6A**	**S-7**	**S-**
Sample Depth (ft):	**24-26**	**24-25**	**29-31**	**4-6**
Lab ID Number:	**907**	**908**	**910**	**91**
Tested By:	**JM**	**JM**	**JM**	**JM**
Test Date:	**10/10/00**	**10/10/00**	**10/10/00**	**10/10**
Group name:	**Silty sand**	**Poorly graded sand with silt**	**Poorly graded sand with silt**	**Sandy clay**
Group symbol:	**SM**	**SP-SM**	**SP-SM**	**CL**
Particle size range:	**Mostly fine sand, little silt, trace clay**	**Mostly fine sand, few silt**	**Mostly fine sand, few silt**	**Mostly some f sand, littl**
Particle angularity:	**Rounded**	**Subrounded**	**Rounded**	**Round**
Particle shape:	**Flat and elongated**	**Flat and elongated**	**Flat and elongated**	**Flat ar elongat**
Hardness:	**NA**	**NA**	**NA**	**NA**
Plasticity of fines:	**Low-Medium**	**Low-Medium**	**None-low**	**Medium-**
Dry strength :	**Medium-High**	**Low-Medium**	**Medium**	**High**
Dilatancy:	**Slow**	**Rapid**	**Rapid**	**None**
Toughness:	**Medium**	**Medium**	**Low-Medium**	**Medium-**
Color:	**Light gray**	**Dark brown**	**Dark brown**	**Light gr**
Odor:	**None**	**None**	**None**	**None**
Reaction with HCL:	**NA**	**NA**	**NA**	**NA**

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Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (ASTM D2488)

Boston Parks & Recreation Department
ct Name: Muddy River Restoration
ct Location: Boston, MA
ct Number: 1517-28449-PRELDN.CONCPTDN.GEOTECH

lts

ple Number:	SPL-SB-4	SPL-SB-5	EC-SB-5
ple Location:	S-6	S-5	S-6
ple Depth (ft):	24-26	19-21	24-26
D Number:	917	918	919
ed By:	JM	JM	JM
Date:	10/10/00	10/10/00	10/10/00
p name:	Sandy elastic silt	Poorly graded sand with silt	Lean clay
p symbol:	MH	SP-SM	CL
cle size range:	Mostly silt, some clay, little fine sand	Mostly fine sand, few silt	Mostly clay, little silt, trace fine sand
cle angularity:	Subrounded	Subrounded	Subrounded
cle shape:	Flat and elongated	Flat and elongated	Flat and elongated
ness:	NA	NA	NA
ticity of fines:	Medium	None-low	Medium
strength :	Medium	Low	High
ancy:	Slow-rapid	Rapid	Slow
ghness:	Medium	Low	Medium-high
r:	Light gray	Dark brown	Light gray
r:	None	None	None
ction with HCL:	NA	NA	NA

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Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (ASTM D2488)

Client: Boston Parks & Recreation Department
Project Name: Muddy River Restoration
Project Location: Boston, MA
Project Number: 1517-28449-PRELDN.CONCPTDN.GEOTECH

Results

Sample Number:	**SPL-SB-7**	**EC-SB-1**
Sample Location:	**S-3**	**S-5**
Sample Depth (ft):	**9-11**	**19-21**
Lab ID Number:	**933**	**937**
Tested By:	**JM**	**JM**
Test Date:	**10/10/00**	**10/10/00**
Group name:	**Silty sand**	**Poorly graded sand with silt**
Group symbol:	**SM**	**SP-SM**
Particle size range:	**Mostly fine sand, little silt, trace gravel**	**Mostly fine sand, few silt**
Particle angularity:	**Subrounded**	**Subrounded**
Particle shape:	**Flat and elongated**	**Flat and elongated**
Hardness:	**NA**	**NA**
Plasticity of fines:	**None**	**Low**
Dry strength :	**None-low**	**Medium**
Dilatancy:	**Rapid**	**Slow-rapid**
Toughness:	**Low-Medium**	**Low-medium**
Color:	**Dark brown-light gray**	**Light gray-tan**
Odor:	**None**	**None**
Reaction with HCL:	**NA**	**NA**

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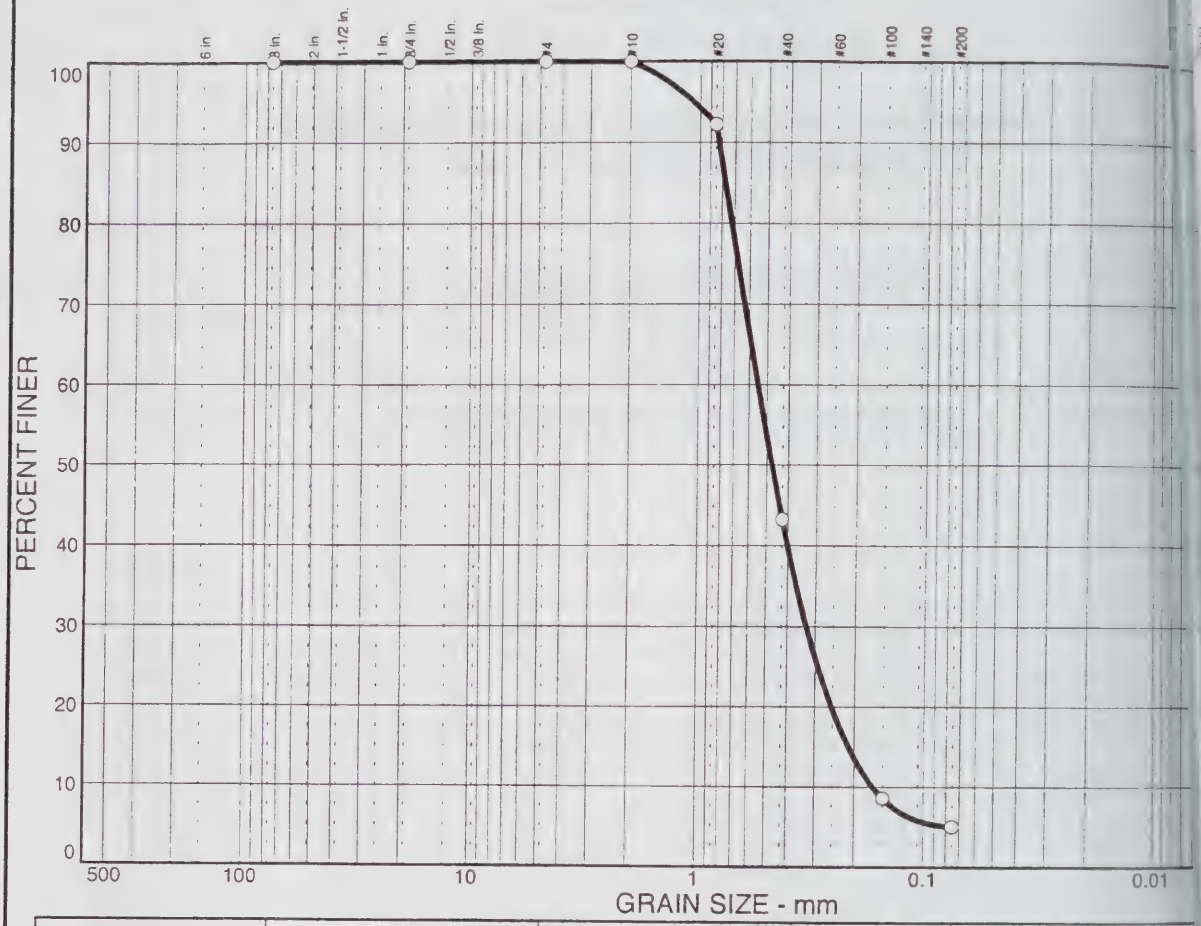
Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) (ASTM D2488)

Boston Parks & Recreation Department
t Name: Muddy River Restoration
t Location: Boston, MA
t Number: 1517-28449-PRELDN.CONCPTDN.GEOTECH

ts

le Number:	EC-SB-3	EC-SB-4
le Location:	S-6	S-8
le Depth (ft):	24-26	34-36
D Number:	925	929
ed By:	JM	JM
Date:	10/10/00	10/10/00
p name:	Sandy elastic silt	Sandy elastic silt
up symbol:	MH	MH
icle size range:	Mostly silt, some clay, little fine sand	Mostly silt, some clay, little fine sand
icle angularity:	Subrounded	Subrounded
icle shape:	Flat and elongated	Flat and elongated
dness:	NA	NA
sticity of fines:	Medium	Medium
strength :	Medium	Medium
tancy:	Slow	Slow-rapid
ughness:	Medium	Medium
lor:	Light gray	Light gray
or:	None	None
action with HCL:	NA	NA

PARTICLE SIZE DISTRIBUTION TEST REPORT



% COBBLES	% GRAVEL		% SAND			% FINES
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT
0.0	0.0	0.0	0.1	56.7	38.2	5.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
3/4	100.0		
#4	100.0		
#10	99.9		
#20	92.2		
#40	43.2		
#100	8.6		
#200	5.0		

* (no specification provided)

Soil Description

Poorly graded sand with silt

Atterberg Limits

PL= --- LL= --- PI=

Coefficients

D_{85}= 0.772 D_{60}= 0.550 D_{50}=
D_{30}= 0.329 D_{15}= 0.213 D_{10}=
C_u= 3.32 C_c= 1.19

Classification

USCS= SP-SM AASHTO= A-1-

Remarks

As received moisture content = 16.3%

Sample No.: SPL-SB-1 **Source of Sample:** --- **Date:**
Location: S-9 **Elev./Depth:**

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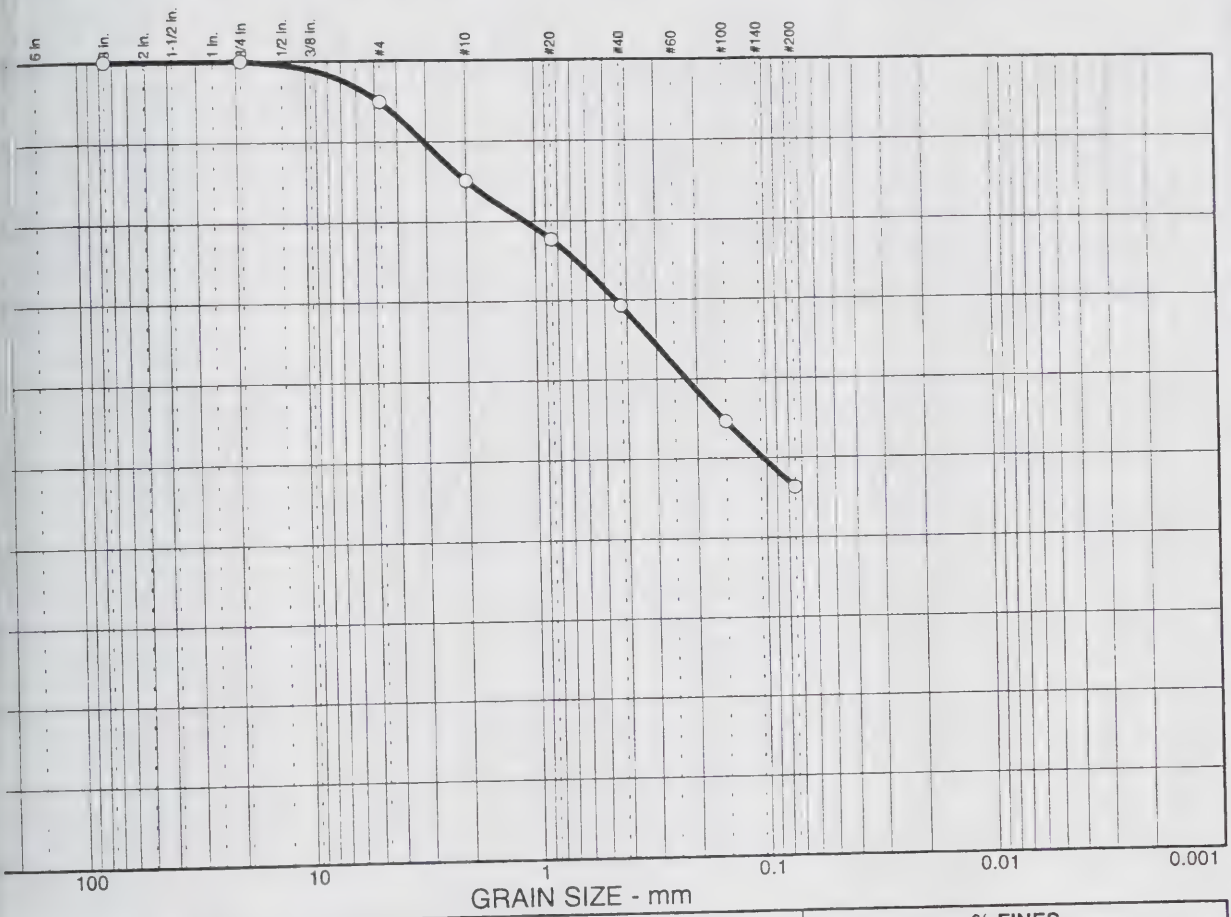
Client: Boston Parks & Recreation Dept.
Project: Muddy River Restoration
Boston, MA
Project No: 1517-28449 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



	% GRAVEL		% SAND			% FINES	
BBLES	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
.0	0.0	5.1	9.8	15.8	23.0	46.3	

PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
100.0		
100.0		
94.9		
85.1		
77.7		
69.3		
54.6		
46.3		

Soil Description

Elastic silt

Atterberg Limits

PL= --- LL= --- PI= ---

Coefficients

D_{85}= 1.98 D_{60}= 0.222 D_{50}= 0.103
D_{30}= D_{15}= D_{10}=
C_u= C_c=

Classification

USCS= SM AASHTO= A-4(0)

Remarks

As received moisture content = 10.1%
Sample description and classification of fines based on visual-manual procedure (ASTM D2488).

no specification provided)

le No.: SPL-SB4
Source of Sample: ---
Date: 10-5-00
Elev./Depth: 4-6FT
cation: S-2

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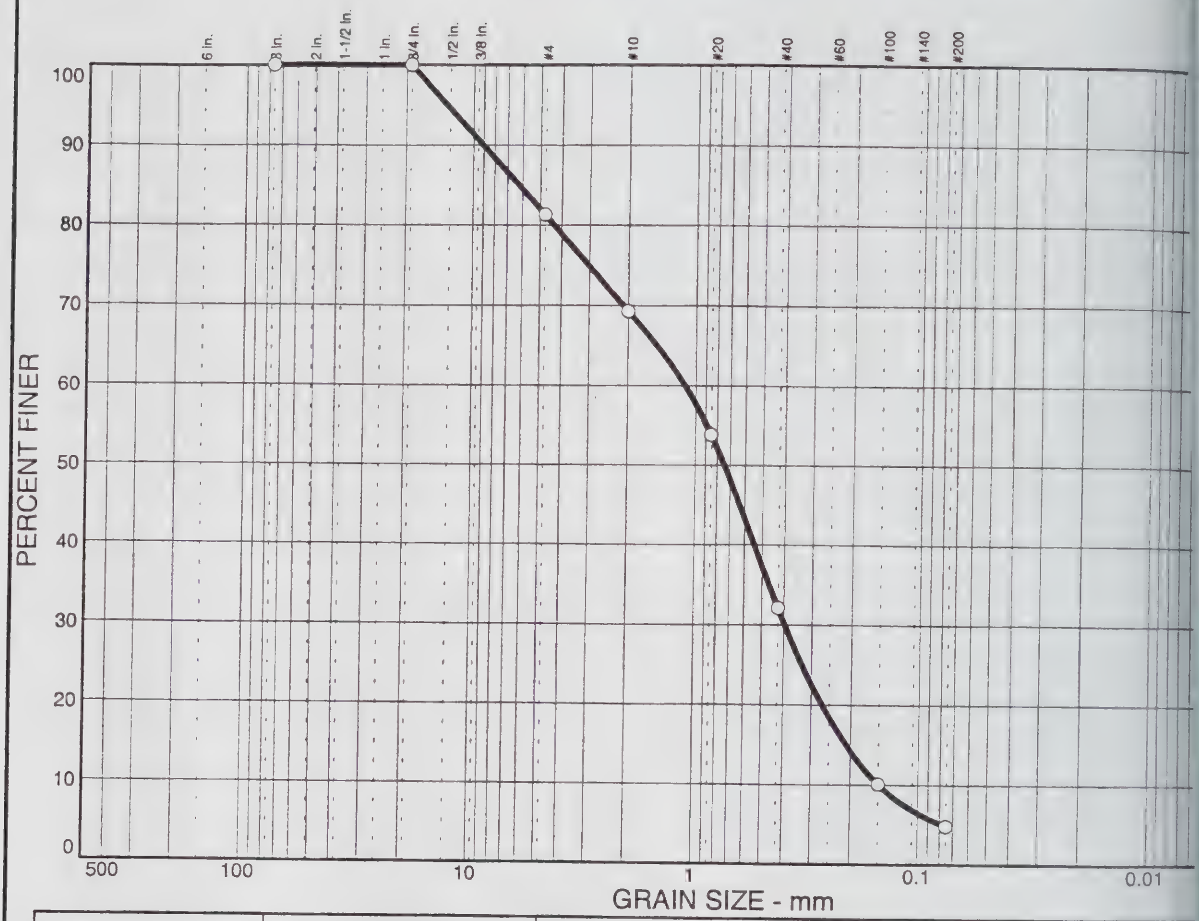
chnical Engineering Laboratory

Client: Boston Parks & Recreation Dept.
Project: Muddy River Restoration
Boston, MA
Project No: 1517-28449 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPOR



% COBBLES	% GRAVEL		% SAND			% FINES
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT
0.0	0.0	18.7	12.0	37.2	27.3	4.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
3/4	100.0		
#4	81.3		
#10	69.3		
#20	53.8		
#40	32.1		
#100	10.1		
#200	4.8		

* (no specification provided)

Soil Description

Poorly graded sand with gravel

Atterberg Limits

PL= ---
LL= ---
PI=

Coefficients

D_{85}= 6.23
D_{60}= 1.11
D_{50}=
D_{30}= 0.396
D_{15}= 0.209
D_{10}=
C_u= 7.49
C_c= 0.95

Classification

USCS= SP
AASHTO= A-1-

Remarks

As received moisture content = 2.2%

Note: One piece of gravel removed from sample, 0.75"X0.75" in diameter.

Sample No.: SPL-SB-3
Location: S-2
Source of Sample: ---
Date
Elev./Depth

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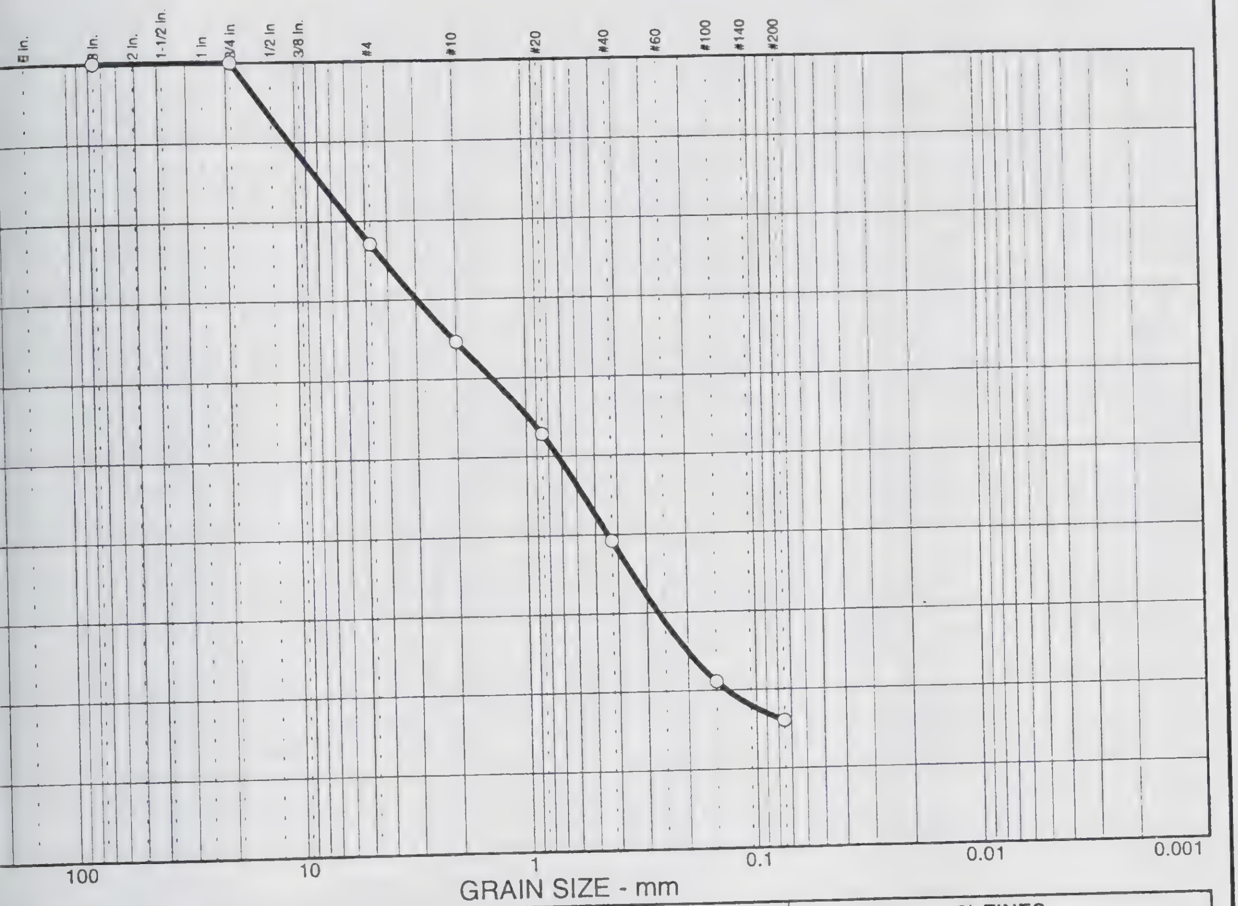
Client: Boston Parks & Recreation Dept.
Project: Muddy River Restoration
Boston, MA
Project No: 1517-28449
Plate

PARTICLE SIZE DISTRIBUTION TEST REPORT



BLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
0	0.0	22.9	12.5	25.4	23.2	16.0	

PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
100.0		
100.0		
77.1		
64.6		
52.8		
39.2		
21.1		
16.0		

specification provided)

Soil Description

Silty sand with gravel
Note: Two pieces of gravel removed from sample, they were 1.0"-0.5" in diameter.

Atterberg Limits

PL= ---
LL= ---
PI= ---

Coefficients

D_{85}= 7.78
D_{60}= 1.40
D_{50}= 0.726
D_{30}= 0.268
D_{15}=
D_{10}=
C_u=
C_c=

Classification

USCS= SM
AASHTO= ---

Remarks

As received moisture content = 12.0%
Sample description and classification of fines based on visual-manual procedure (ASTM D2488).

No.: SPL-SB-4
tion: S-7
Source of Sample: ---
Date: 10-3-00
Elev./Depth: 29-31FT

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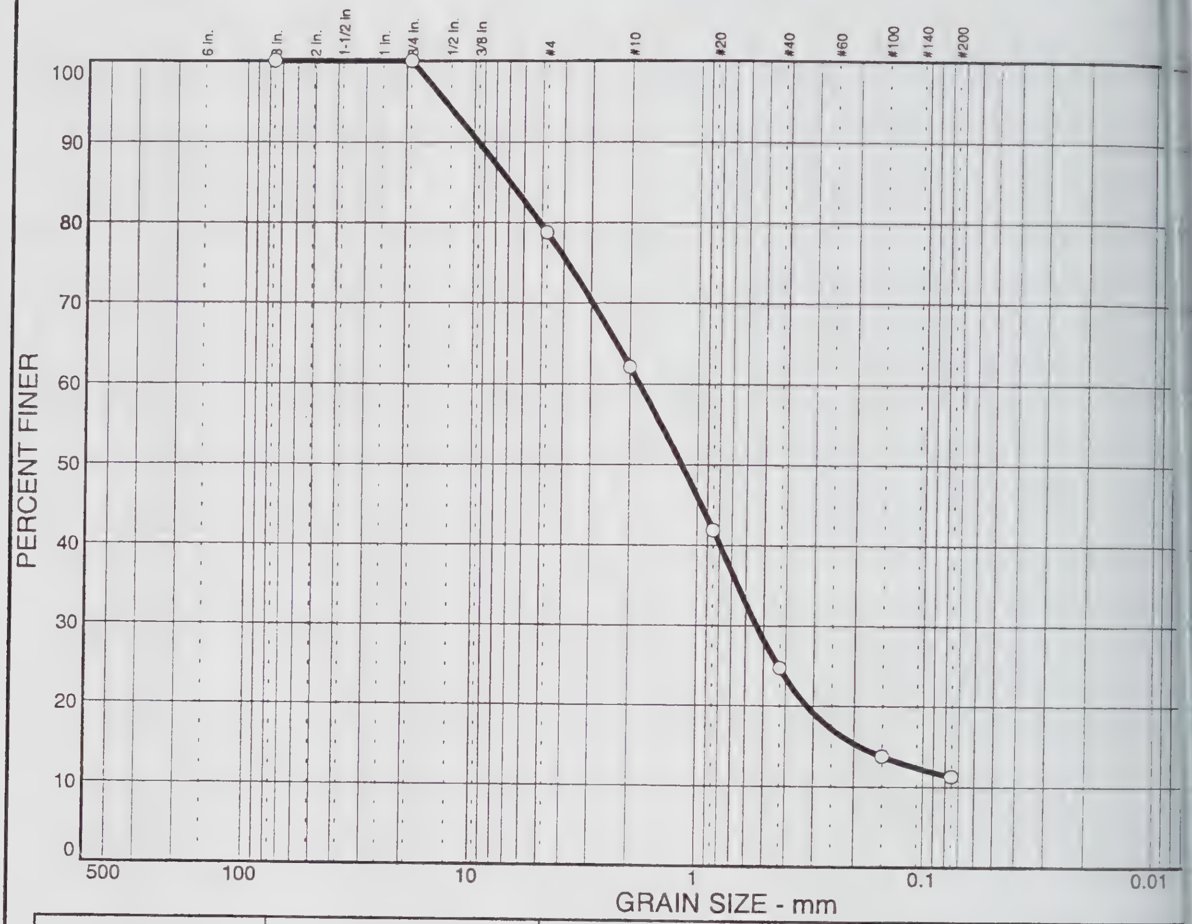
nical Engineering Laboratory

Client: Boston Parks & Recreation Dept.
Project: Muddy River Restoration
Boston, MA
Project No: 1517-28449
Plate

PARTICLE SIZE DISTRIBUTION TEST REPO



% COBBLES	% GRAVEL		% SAND			% FINE
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT
0.0	0.0	21.2	16.7	37.4	13.4	11.3

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
3/4	100.0		
#4	78.8		
#10	62.1		
#20	41.9		
#40	24.7		
#100	13.8		
#200	11.3		

* (no specification provided)

Soil Description

Poorly graded sand with silt and gravel

Atterberg Limits

PL= --- LL= --- PI=

Coefficients

D_{85}= 6.91 D_{60}= 1.81 D_{50}
D_{30}= 0.539 D_{15}= 0.188 D_{10}
C_u= C_c=

Classification

USCS= SP-SM AASHTO= --

Remarks

As received moisture content = 8.5%
Sample description and classification of fines ba
manual procedure (ASTM D2488).

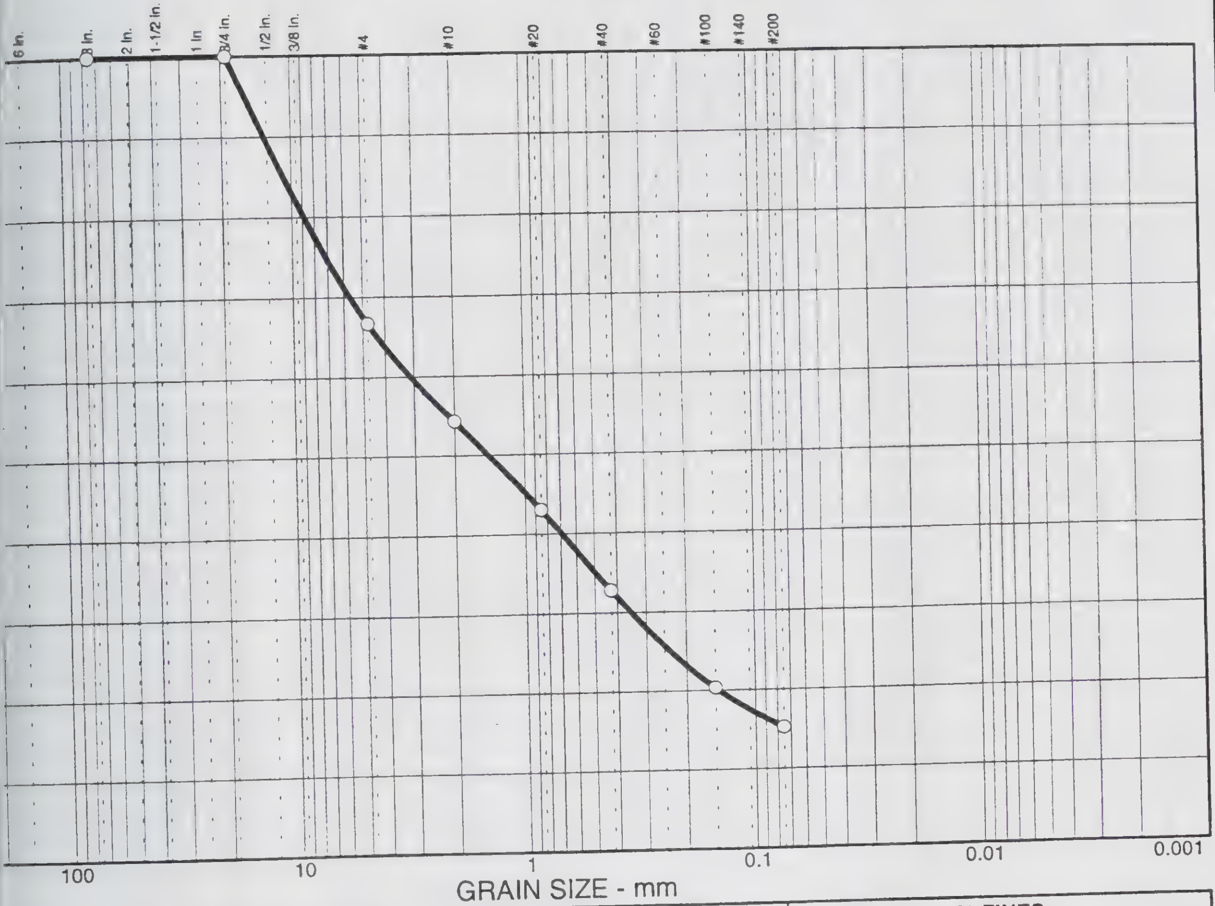
Sample No.: SPL-SB-7
Location: S-4
Source of Sample: ---
Date
Elev./Depth

CDM Jessberger

Geotechnical Engineering Laboratory

Client: Boston Parks & Recreation Dept.
Project: Muddy River Restoration
Boston, MA
Project No: 1517-28449 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



BLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
)	0.0	33.3	12.4	21.5	17.6	15.2	

PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
100.0		
100.0		
66.7		
54.3		
43.0		
32.8		
20.3		
15.2		

Soil Description

Silty sand with gravel

Atterberg Limits

PL= --- LL= --- PI= ---

Coefficients

D_{85}= 10.8 D_{60}= 3.10 D_{50}= 1.43

D_{30}= 0.348 D_{15}= D_{10}=

C_u= C_c=

Classification

USCS= SM AASHTO= ---

Remarks

As received moisture content = 6.5%

Sample description and classification of fines based on visual-manual procedure (ASTM D2488).

specification provided)

No.: EC-SB-1 **Source of Sample:** --- **Date:** 10-3-00

tion: S-3 **Elev./Depth:** 9-11FT

CDM Jessberger

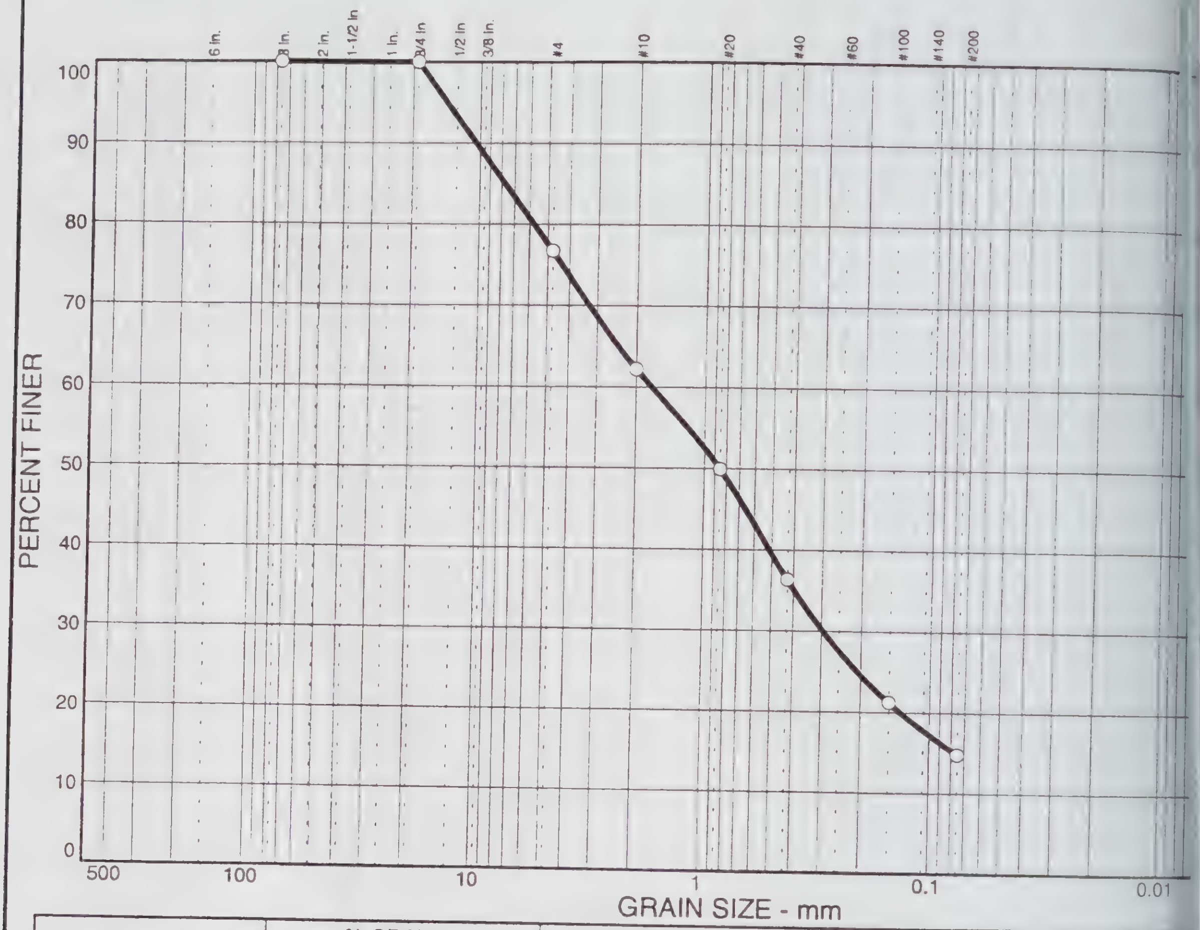
nical Engineering Laboratory

Client: Boston Parks & Recreation Dept.

Project: Muddy River Restoration
Boston, MA

Project No: 1517-28449 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPO



% COBBLES	% GRAVEL		% SAND			% FINE
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT
0.0	0.0	23.3	14.5	25.9	21.5	14.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
3/4	100.0		
#4	76.7		
#10	62.2		
#20	49.9		
#40	36.3		
#100	21.2		
#200	14.8		

* (no specification provided)

Soil Description

Silty sand with gravel

Atterberg Limits

PL= --- LL= --- PI=

Coefficients

D_{85}= 7.70 D_{60}= 1.71 D_{50}

D_{30}= 0.295 D_{15}= 0.0768 D_{10}

C_u= C_c=

Classification

USCS= SM AASHTO= ---

Remarks

As received moisture content = 5.9%
Sample description and classification of fines b
manual procedure (ASTM D2488).

Sample No.: EC-SB-1 **Source of Sample:** --- **Dat**

Location: S-2 **Elev./Depth**

CDM Jessberger

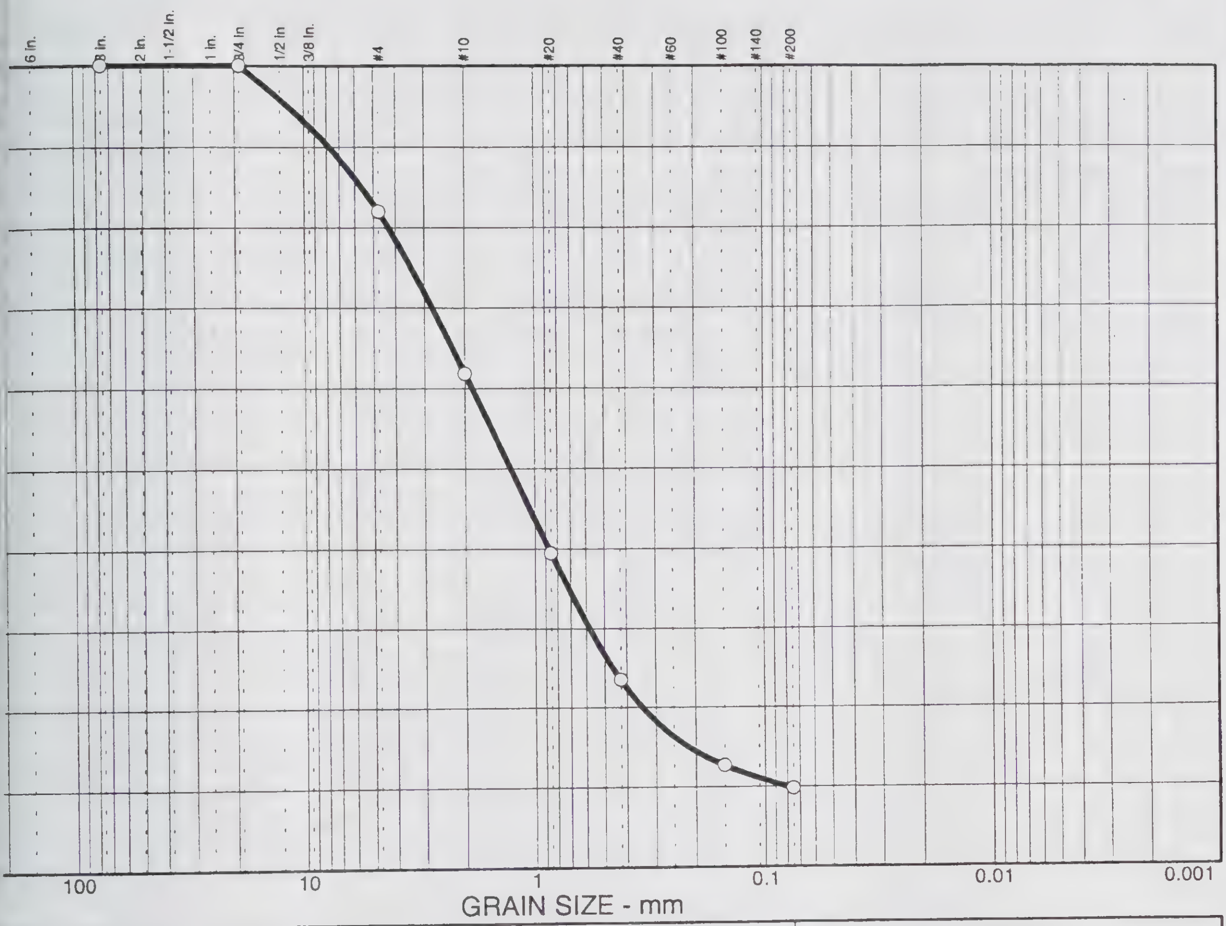
Geotechnical Engineering Laboratory

Client: Boston Parks & Recreation Dept.

Project: Muddy River Restoration
Boston, MA

Project No: 1517-28449 **Plate**

PARTICLE SIZE DISTRIBUTION TEST REPORT



BLES	% GRAVEL		% SAND			% FINES	
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT	CLAY
)	0.0	18.0	20.2	38.3	13.7	9.8	

PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
100.0		
100.0		
82.0		
61.8		
39.5		
23.5		
12.7		
9.8		

specification provided)

Soil Description

Well-graded sand with silt and gravel

Atterberg Limits

PL= ---
LL= ---
PI= ---

Coefficients

D_{85}= 5.60
D_{60}= 1.87
D_{50}= 1.27
D_{30}= 0.580
D_{15}= 0.215
D_{10}= 0.0792
C_u= 23.55
C_c= 2.28

Classification

USCS= SW-SM
AASHTO= ---

Remarks

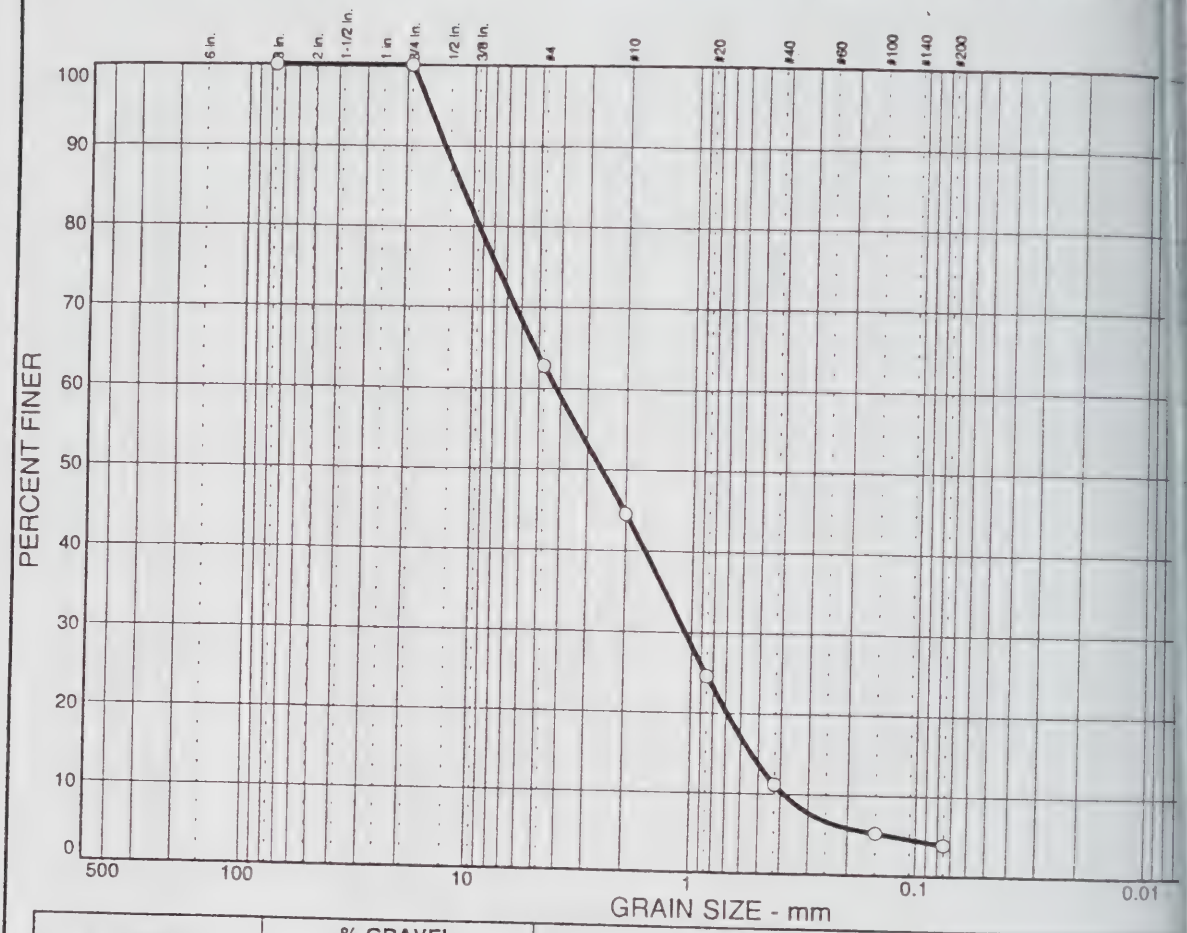
As received moisture content = 10.0%
Sample description and classification of fines based on visual-manual procedure (ASTM D2488).

No.: EC-SB-3
tion: S-4
Source of Sample: ---
Date: 10-3-00
Elev./Depth: 14-16FT

CDM Jessberger
nical Engineering Laboratory

Client: Boston Parks & Recreation Dept.
Project: Muddy River Restoration
Boston, MA
Project No: 1517-28449
Plate

PARTICLE SIZE DISTRIBUTION TEST REPO



% COBBLES	% GRAVEL		% SAND			% FINE
	CRS.	FINE	CRS.	MEDIUM	FINE	SILT
0.0	0.0	37.2	18.3	33.3	7.3	3.9

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3	100.0		
3/4	100.0		
#4	62.8		
#10	44.5		
#20	24.6		
#40	11.2		
#100	5.3		
#200	3.9		

* (no specification provided)

Soil Description

Poorly graded sand with gravel

Atterberg Limits

PL= --- LL= --- PI=

Coefficients

D_{85}= 11.3 D_{60}= 4.19 D_{50}=
D_{30}= 1.07 D_{15}= 0.539 D_{10}=
C_u= 10.85 C_c= 0.71

Classification

USCS= SP AASHTO= A-1-

Remarks

As received moisture content = 2.0%

Sample No.: EC-SB-4
Location: S-3
Source of Sample: ---
Date
Elev./Depth

CDM Jessberger

Geotechnical Engineering Laboratory

Client: Boston Parks & Recreation Dept.
Project: Muddy River Restoration
Boston, MA
Project No: 1517-28449
Plate

CH, INC. — UNCONSOLIDATED UNDRAINED COMPRESSION TEST SUMMARY — TEST No. UU03

Muddy River Restoration
Boston, Massachusetts

FILE No. 12574-004

DATE TESTED AUG 2000

SAMPLE DESCRIPTION: Gray green silty CLAY,
with frequent silt partings

EC-SB-3
U16
69.2

	PRESHEAR	FINAL
SIONS:		
(cm)	7.994	6.486
er (cm)	3.482	3.866
q. cm)	9.522	11.736
(cc)	76.122	76.122
HT (g)	158.45	
NT (%)	26.5	25.8
EIGHT (pcf)	129.9	129.9
HT (pcf)	102.7	103.3
TURATION (%)	111.7	110.3
	0.641	0.632
ECIFIC GRAVITY, G		2.700

SAMPLE QUALITY
{ }GOOD
{x}FAIR
{ }POOR

DISPLACEMENT RATE (mm/min) 0.063

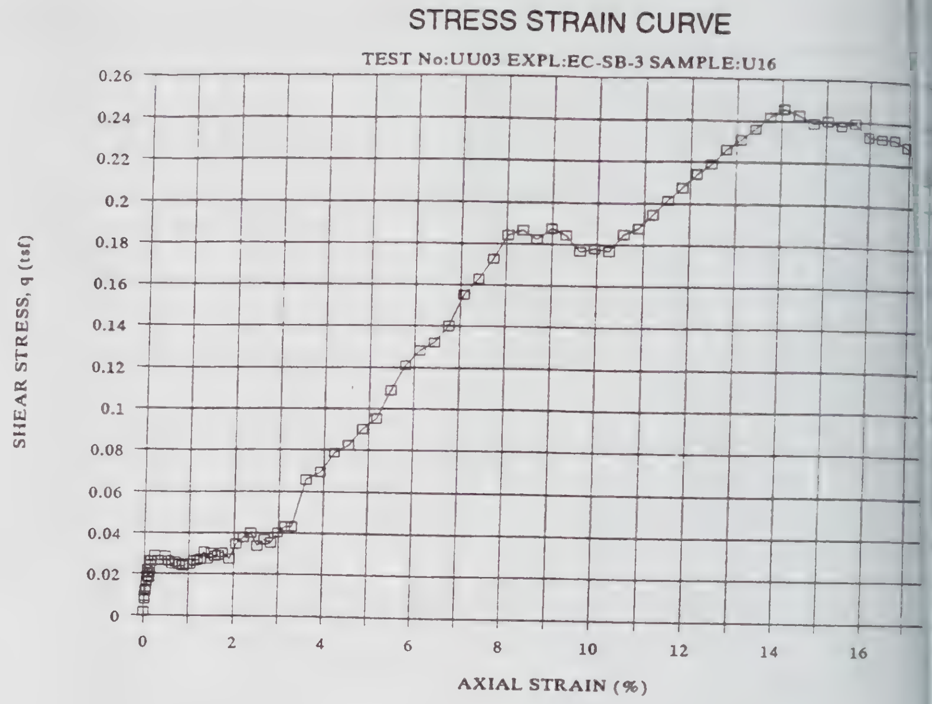
AXIAL STRAIN RATE (%/hour) 4.75

TEST RESULTS

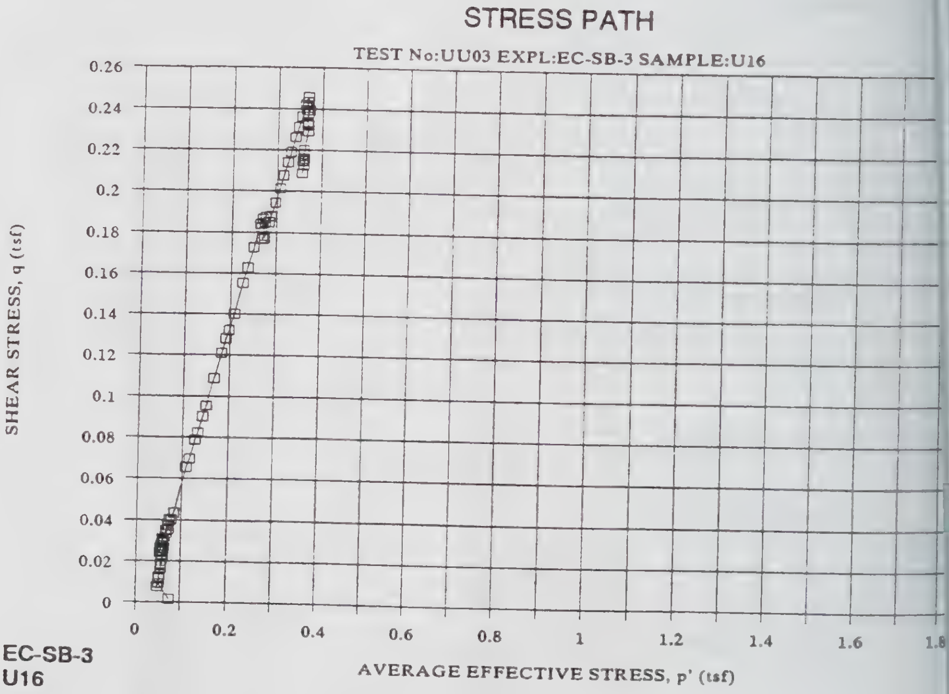
PEAK UNDRAINED SHEAR STRENGTH, cu (tsf) : 0.246

MODE OF FAILURE:
Bulge

AXIAL STRAIN (%)	SHEAR STRESS, q (tsf)	AVG. EFFECTIVE STRESS, p' (tsf)	AVG. TOTAL STRESS, p (tsf)	PORE PRESSURE u (tsf)	STRESS RATIO, q/p'	PORE PRESS. PARAM. A	SECANT YOUNG'S MODULUS, E (tsf)	REMARKS
0.00	0.002	0.075	0.680	0.606	0.022			
0.05	0.016	0.055	0.696	0.641	0.298	1.190	60.5	
0.11	0.018	0.055	0.698	0.644	0.335	1.143	33.8	
0.23	0.029	0.062	0.711	0.648	0.468	0.777	25.6	
0.39	0.026	0.057	0.710	0.652	0.463	0.944	13.7	
0.47	0.029	0.059	0.713	0.654	0.491	0.893	12.4	
0.54	0.026	0.056	0.711	0.656	0.472	1.015	9.6	
0.62	0.025	0.053	0.710	0.657	0.467	1.113	7.9	
0.95	0.025	0.052	0.713	0.661	0.477	1.195	5.3	
1.26	0.027	0.055	0.718	0.664	0.502	1.123	4.4	
1.50	0.030	0.058	0.723	0.665	0.520	1.041	4.0	
1.74	0.030	0.059	0.725	0.666	0.512	1.046	3.5	
2.37	0.040	0.073	0.739	0.666	0.549	0.787	3.4	
2.83	0.035	0.072	0.737	0.665	0.493	0.886	2.5	
3.30	0.043	0.084	0.748	0.664	0.516	0.703	2.6	
4.55	0.082	0.133	0.793	0.660	0.620	0.336	3.6	
5.48	0.109	0.167	0.824	0.656	0.651	0.237	4.0	
6.44	0.132	0.199	0.850	0.652	0.666	0.176	4.1	
7.71	0.173	0.250	0.895	0.645	0.691	0.116	4.5	
8.66	0.183	0.267	0.908	0.641	0.683	0.097	4.2	
9.62	0.177	0.268	0.904	0.636	0.659	0.087	3.7	
10.88	0.188	0.288	0.918	0.630	0.652	0.066	3.5	
11.83	0.208	0.315	0.940	0.625	0.660	0.048	3.5	
13.09	0.231	0.347	0.966	0.619	0.666	0.029	3.5	
14.06	0.246	0.368	0.982	0.614	0.668	0.017	3.5	
15.03	0.241	0.368	0.979	0.610	0.653	0.010	3.2	
15.98	0.233	0.367	0.973	0.606	0.636	0.001	2.9	
17.24	0.220	0.360	0.962	0.602	0.612	-0.009	2.6	
18.19	0.215	0.359	0.958	0.599	0.599	-0.017	2.4	
19.01	0.209	0.356	0.952	0.596	0.586	-0.024	2.2	


STRESS STRAIN CURVE

TEST No:UU03 EXPL:EC-SB-3 SAMPLE:U16


STRESS PATH

TEST No:UU03 EXPL:EC-SB-3 SAMPLE:U16

Boring No. :	EC-SB-3
Sample No. :	U16
Depth (ft.) :	69.2
Test No. :	UU03

Sample Description : Gray green silty CLAY, with frequent silt partings

Initial Water Content (%) :	26.5
Shear Strength, cu (tsf) :	0.246

Sample Quality : FAIR

10-Aug-2000 ; PC #19

HALEY & ALDRICH,

Geotechnical Engineers & Environmental C

Muddy River Restoration
Boston, Massachusetts

UNCONSOLIDATED UNDRAINE
COMPRESSION TES

FILE NO. 12574-004

CH, INC.

UNCONSOLIDATED UNDRAINED COMPRESSION TEST SUMMARY

TEST No. UU04

Muddy River Restoration
Boston, Massachusetts

FILE No. 12574-004

DATE TESTED AUG 2000

SAMPLE DESCRIPTION: Stiff gray green silty CLAY, trace medium sand

SPL-SB-2
U09
39.15

	PRESHEAR	FINAL
SIONS:		
(cm)	8.039	6.700
er (cm)	3.548	3.886
q. cm)	9.887	11.863
(cc)	79.480	79.480
IT (g)	167.84	
NT (%)	24.0	23.7
IGHT (pcf)	131.8	131.8
HT (pcf)	106.3	106.5
TURATION (%)	110.8	110.1
	0.586	0.582
ECIFIC GRAVITY, G		2.700

SAMPLE QUALITY
{x}GOOD
{ }FAIR
{ }POOR

DISPLACEMENT RATE (mm/min) 0.060

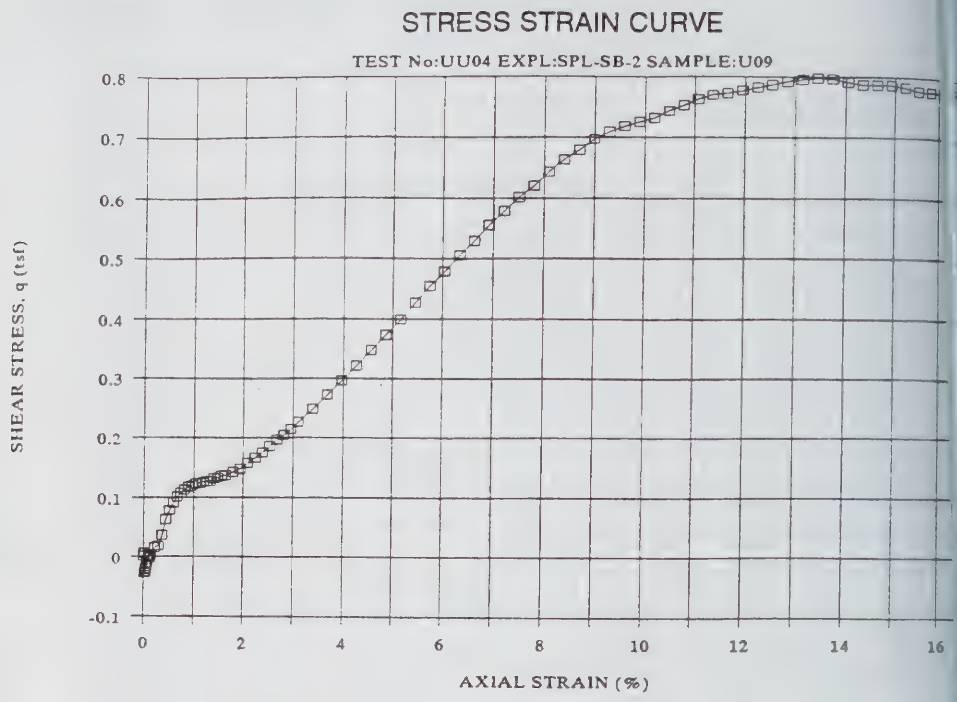
AXIAL STRAIN RATE (%/hour) 4.48

TEST RESULTS

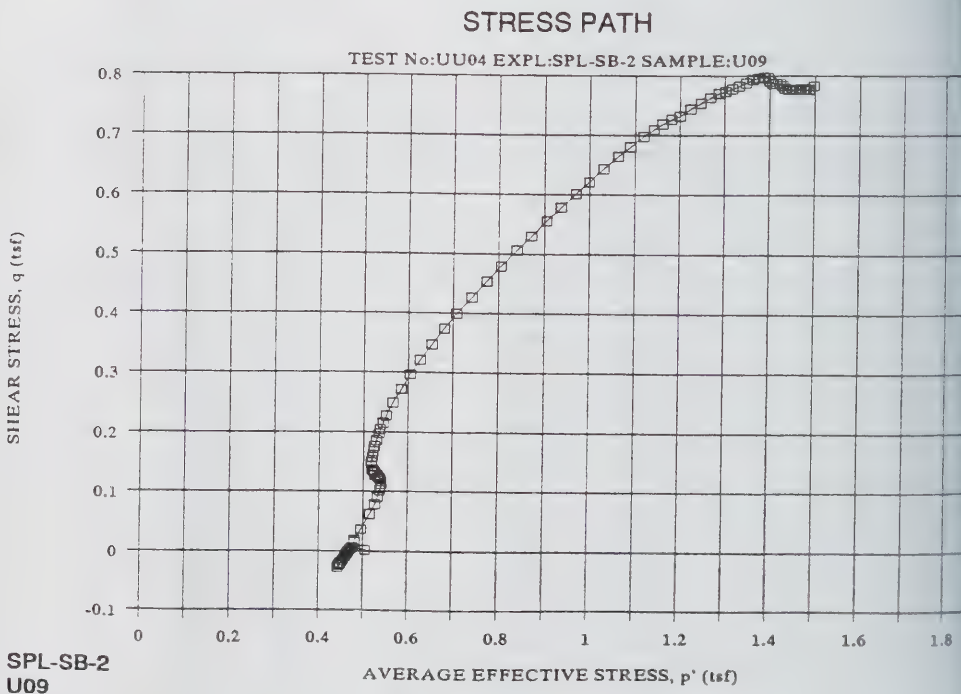
PEAK UNDRAINED SHEAR STRENGTH, cu (tsf) : 0.798

MODE OF FAILURE:
Bulge

AXIAL STRAIN (%)	SHEAR STRESS, q (tsf)	AVG. EFFECTIVE STRESS, p' (tsf)	AVG. TOTAL STRESS, p (tsf)	PORE PRESSURE u (tsf)	STRESS RATIO, q/p'	PORE PRESS. PARAM. A	SECANT YOUNG'S MODULUS, E (tsf)	REMARKS
0.00	0.002	0.505	0.813	0.307	0.003			
0.05	-0.016	0.454	0.796	0.342	-0.036	-0.961	-63.6	
0.10	0.001	0.470	0.814	0.344	0.003	-175.142	2.8	
0.21	0.015	0.481	0.831	0.350	0.032	1.542	14.3	
0.36	0.037	0.496	0.854	0.358	0.074	0.718	20.2	
0.44	0.062	0.515	0.881	0.365	0.121	0.480	28.5	
0.51	0.078	0.526	0.898	0.372	0.149	0.422	30.7	
0.59	0.090	0.532	0.911	0.379	0.170	0.402	30.8	
0.88	0.117	0.540	0.941	0.401	0.216	0.407	26.4	
1.19	0.125	0.533	0.953	0.420	0.235	0.456	21.1	
1.41	0.131	0.527	0.960	0.433	0.248	0.488	18.6	
1.63	0.137	0.521	0.968	0.447	0.262	0.516	16.7	
2.23	0.167	0.523	1.001	0.478	0.319	0.517	15.0	
2.67	0.197	0.536	1.034	0.498	0.368	0.488	14.8	
3.10	0.227	0.552	1.065	0.514	0.412	0.458	14.7	
4.26	0.322	0.627	1.163	0.536	0.513	0.357	15.1	
5.16	0.399	0.708	1.243	0.536	0.564	0.288	15.5	
6.04	0.479	0.805	1.331	0.527	0.595	0.230	15.9	
7.20	0.579	0.936	1.434	0.498	0.619	0.165	16.1	
8.09	0.643	1.031	1.500	0.469	0.624	0.126	15.9	
8.99	0.698	1.119	1.556	0.437	0.624	0.093	15.5	
10.19	0.732	1.200	1.591	0.392	0.610	0.058	14.4	
11.06	0.763	1.269	1.628	0.360	0.602	0.034	13.8	
12.24	0.782	1.331	1.650	0.318	0.588	0.007	12.8	
13.14	0.796	1.376	1.664	0.288	0.578	-0.012	12.1	
14.04	0.791	1.400	1.659	0.259	0.565	-0.031	11.3	
14.92	0.787	1.423	1.655	0.232	0.553	-0.048	10.5	
16.11	0.776	1.450	1.649	0.199	0.536	-0.070	9.6	
17.01	0.778	1.474	1.653	0.179	0.528	-0.083	9.2	
17.91	0.783	1.497	1.657	0.160	0.523	-0.094	8.7	


STRESS STRAIN CURVE

TEST No:UU04 EXPL:SPL-SB-2 SAMPLE:U09


STRESS PATH

TEST No:UU04 EXPL:SPL-SB-2 SAMPLE:U09

Boring No. :	**SPL-SB-2**
Sample No. :	**U09**
Depth (ft.) :	**39.15**
Test No. :	**UU04**

Sample Description : Stiff gray green silty CLAY, trace medium sand

H A L E Y & A L D R I C H, I
Geotechnical Engineers & Environmental Con

Muddy River Restoration
Boston, Massachusetts

Initial Water Content (%) :	24.0
Shear Strength, cu (tsf) :	0.798

Sample Quality : GOOD

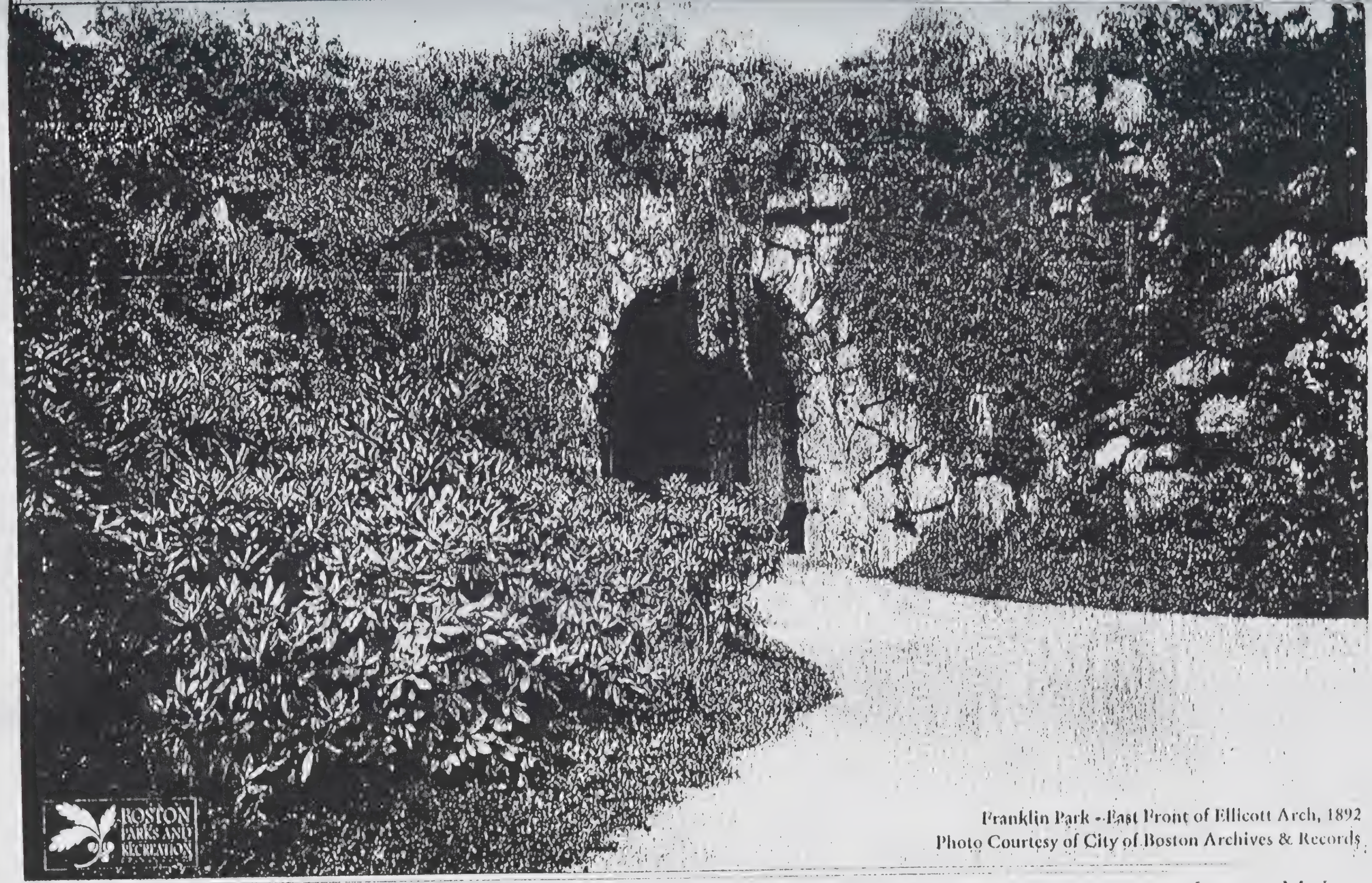
UNCONSOLIDATED UNDRAINED
COMPRESSION TEST

10-Aug-2000 ; PC #19

FILE NO. 12574-004

Appendix D

Emerald Necklace Plant List



Franklin Park - East Front of Ellicott Arch, 1892
Photo Courtesy of City of Boston Archives & Records

CITY OF BOSTON PARKS AND RECREATION DEPARTMENT • MAYOR THOMAS M. MENINO • COMMISSIONER JUSTINE M. LIFF

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    Muddy River Source Lists. page 47

Frederick Law Olmsted's Emerald Necklace Plant List

The following Frederick Law Olmsted Emerald Necklace Plant List was compiled from several historic plant lists (copies of which are included in the Appendix) to form a comprehensive document that will serve as a reference for historic park plantings. The list covers the Muddy River, including the Back Bay Fens, and Franklin Park. The primary resource for this list is Cynthia Zaitzevsky's Frederick Law Olmsted and the Boston Park System, with supplemental information from the Frederick Law Olmsted National Historic Site. A fall hazard planting list has also been included in the Appendix.

Each list has been alphabetized by Latin name for easy reference and includes the following information: common name, historic use and location, identification character (letter or number) recorded on the historic plans, source from which the data was collected, defining notes, and quantities for Brookline and Boston. A question mark indicates that the quantity is unclear, or it is unclear whether the plant has been struck out, or the name cannot be determined (some original lists are handwritten). Plants ordered by Arnold Arboretum Director Charles Sprague Sargent are indicated by an asterisk (*) next to the plant symbol; plants deleted from the April 1892 plant list by Sargent but reinstated by John Olmsted are indicated by this symbol (~), following the plant's identification character.

Muddy River

Abies alba Silver fir	Brookline 1892	Cumberland Ave.				
Acanthopanax sieboldianus Five-leaf Acanthopanax	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	81	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	49 deleted
Acer negundo Box Elder	Muddy River, Brookline & Boston, 1892 & 1893		11	Zaitzevsky p.216		10/13
Acer platanoides Norway Maple	Back Bay Fens, circa 1885	Northern Basin	13	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Acer rubrum Red Maple	Back Bay Fens, circa 1885	Northern Basin	11	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Acer rubrum Red Maple	Muddy River, Brookline & Boston, 1892 & 1893		10	Zaitzevsky p.216		30/40
Acer saccharinum Silver Maple	Back Bay Fens, circa 1885	Northern Basin	12	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Acer saccharinum Silver Maple	Muddy River, Brookline & Boston, 1892 & 1893		9	Zaitzevsky p.216		30/40
Acer saccharum Sugar Maple	Back Bay Fens, circa 1885	Northern Basin	14	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Acer saccharum Sugar Maple	Muddy River, Brookline & Boston, 1892 & 1893		8*	Zaitzevsky p.216		200/260
Acer spicatum Mountain Maple	Muddy River, Brookline & Boston, 1892 & 1893		70	Zaitzevsky p.217		75/100

Frederick Law Olmsted Plant List
Muddy River

Scientific Name Common Name	Historic Use	Location	Symbol on Plan	Historic Source	Notes	Quantity Brookline/Boston
Acorus calamus Sweetflag	Muddy River, Brookline, 1893	Brookline	176	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	200
Adiantum pedatum Maidenhair Fern	Muddy River, Brookline, 1893	Brookline	163	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	400
Ailanthus altissima, female Tree of Heaven	Back Bay Fens, circa 1885	Northern Basin	4	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Ajuga genevensis Geneva Bugle	Muddy River, Brookline, 1893	Brookline	170	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	500
Akebia quinata Fiveleaf Akebia	Muddy River, Brookline & Boston, 1892 & 1893		99	Zaitzevsky p.217		300/400
Alnus firma ?	Muddy River, Brookline & Boston, 1892 & 1893		123	Zaitzevsky p.218		?/?
Alnus incana Speckled Alder	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	69	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	?
Amelanchier canadensis Shadblow Serviceberry	Muddy River, Brookline & Boston, 1892 & 1893		124	Zaitzevsky p.218		150/200
Anemone canadensis Meadow Anemone	Muddy River, Brookline, 1893	Brookline	177	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	700
Aronia arbutifolia Red Chokeberry	Muddy River, Brookline & Boston, 1892 & 1893		128	Zaitzevsky p.218		25/30
Aster novae-angliae New England Aster	Muddy River, Brookline, 1893	Brookline	172	Zaitzevsky p.220	Additional plants ordered by Olmsted	

Asters Aster	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on the margin of the water and along the shores above common flood but subject to spray	A	Zaitzevsky p.188	Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Athyrium felixfemina *Lady Fern*	Muddy River, Brookline, 1893	Brookline	167	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	300
Baccharis halimifolia Groundsel Bush	Muddy River, Brookline & Boston, 1892 & 1893		115	Zaitzevsky p.218		?
Bayberry	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on exposed dry slopes	B	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Beach Peas	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on the margin of the water and along the shores above common flood but subject to spray	A	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Berberis Barberry	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on high ground, on the knolls, and along the base of the wall	C	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Berberis thunbergii Japanese Barberry	Muddy River, Brookline & Boston, 1892 & 1893		97*	Zaitzevsky p.217		1800/2400

Frederick Law Olmsted Plant List
Muddy River

Scientific Name Common Name	Historic Use	Location	Symbol on Plan	Historic Source	Notes	Quantity Brookline/Boston
Berberis vulgaris Common Barberry	Muddy River, Brookline & Boston, 1892 & 1893		96*	Zaitzevsky p.217		1300/1700
Betula lenta Sweet Birch	Back Bay Fens, circa 1885	Northern Basin	18	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Betula lenta Sweet Birch	Muddy River, Brookline & Boston, 1892 & 1893		24	Zaitzevsky p.216		5/7
Betula lutea Yellow Birch	Muddy River, Brookline & Boston, 1892 & 1893		25	Zaitzevsky p.216		10/13
Betula nana Dwarf Birch	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on high ground, on the knolls, and along the base of the wall	C	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Betula Nigra River Birch	Back Bay Fens, circa 1885	Northern Basin	20	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Betula nigra River Birch	Muddy River, Brookline & Boston, 1892 & 1893		23	Zaitzevsky p.216		18/24
Betula papyrifera White Birch	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on high ground, on the knolls, and along the base of the wall	C	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Betula papyrifera	Back Bay Fens,					

Betula papyrifera Paper Birch	Muddy River, Brookline & Boston, 1892 & 1893		27	Zaitzevsky p.216		
Betula pendula European Birch	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	22	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	?
Betula pendula European Birch	Back Bay Fens, circa 1885	Northern Basin	17	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Betula populifolia Gray Birch	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	26	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	3 deleted
Blackberry	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on exposed dry slopes	B	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Boltonia latisquama Violet Boltonia	Muddy River, Brookline, 1893	Brookline	180	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	150
Caltha palustris Marsh Marigold	Muddy River, Brookline, 1893	Brookline	158	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	500
Calycanthus floridus Carolina Allspice	Muddy River, Brookline & Boston, 1892 & 1893		74?~	Zaitzevsky p.217		350/500
Cardamine pratensis Cuckooflower	Muddy River, Brookline, 1893	Brookline	175	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	300
Carpinus caroliniana American Hornbeam	Muddy River, Brookline & Boston, 1892 & 1893		46	Zaitzevsky p.216		5/7
Cassia marilandica Wild Senna	Muddy River, Brookline, 1893	Brookline	181	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	30

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Muddy River

Scientific Name Common Name	Historic Use	Location	Symbol on Plan	Historic Source	Notes	Quantity Brookline/Boston
Ceanothus americanus New Jersey Tea	Muddy River, Brookline & Boston, 1892 & 1893		84	Zaitzevsky p.217		1115/1500
Celastrus scadens American Bittersweet	Muddy River, Brookline & Boston, 1892 & 1893		79*	Zaitzevsky p.217		409/550
Celtis occidentalis Hackberry	Muddy River, Brookline & Boston, 1892 & 1893		28	Zaitzevsky p.216		5/7
Cephalanthus occidentalis Button Bush	Muddy River, Brookline & Boston, 1892 & 1893		83	Zaitzevsky p.217		330/400
Cercis canadensis Eastern Redbud	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	44	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	?
Chionanthus virginicus Fringetree	Muddy River, Brookline & Boston, 1892 & 1893		125	Zaitzevsky p.218		?/?
Cladrastis lutea American Yellowwood	Back Bay Fens, circa 1885	Northern Basin	24	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Clematis Clematis	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on exposed dry slopes	B	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Clematis virginiana Virgin's Bower	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	102	Zaitzevsky p.219	Plants deleted by Sargent from plant list	
Clematis vitalba						

Clethra alnifolia Summersweet	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on high ground, on the knolls, and along the base of the wall	C	Zaitzevsky p.188	Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Clethra alnifolia Summersweet+A78	Muddy River, Brookline & Boston, 1892 & 1893		80	Zaitzevsky p.217		2400/3200
Colutea arborescens Bladder Senna	Muddy River, Brookline & Boston, 1892 & 1893		116~	Zaitzevsky p.218		150/200
Comptonia peregrina Sweetfern	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on exposed dry slopes	B	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Comptonia peregrina asplenifolia Sweetfern	Muddy River, Brookline & Boston, 1892 & 1893		133*	Zaitzevsky p.218		1000/1400
Coreopsis lanceolata Lance Coreopsis	Muddy River, Brookline, 1893	Brookline	182	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	300
Cornus alternifolia Alternate-leaved Dogwood	Muddy River, Brookline & Boston, 1892 & 1893		61*	Zaitzevsky p.216		1040/1350
Cornus amomum Silky Dogwood	Muddy River, Brookline & Boston, 1892 & 1893		64	Zaitzevsky p.216		180/240

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Muddy River

Scientific Name Common Name	Historic Use	Location	Symbol on Plan	Historic Source	Notes	Quantity Brookline/Boston
Cornus florida Flowering Dogwood	Muddy River, Brookline & Boston, 1892 & 1893		60*	Zaitzevsky p.216		300/400
Cornus racemosa Gray Dogwood	Muddy River, Brookline & Boston, 1892 & 1893		62*	Zaitzevsky p.216		1320/1700
Cornus sanguinea Bloodtwig Dogwood	Muddy River, Brookline & Boston, 1892 & 1893		63	Zaitzevsky p.216		603/800
Cornus sericea Red Osier Dogwood	Muddy River, Brookline & Boston, 1892 & 1893		65	Zaitzevsky p.216		600/800
Cotoneaster dammeri Bearberry	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on exposed dry slopes	B	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Crataegus crusgalli Cockspur Thorn	Muddy River, Brookline & Boston, 1892 & 1893		66	Zaitzevsky p.217		?/?
Crataegus pedicellata Scarlet Hawthorn	Muddy River, Brookline & Boston, 1892 & 1893		67	Zaitzevsky p.217		251/330
Dennstedtia punctilobula Hay-scented Fern	Muddy River, Brookline, 1893	Brookline	164	Zaitzevsky p.220	Additional plants ordered by Olmsted	

Diervilla lonicera Dwarf Bush-honeysuckle	Muddy River, Brookline & Boston, 1892 & 1893		134	Zaitzevsky p.218		50/70
Elaeagnus multiflorus Cherry Elaeagnus	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	149	Zaitzevsky p.219	Additional plants ordered by Olmsted firm.	5
Erigeron speciosus Oregon Fleabane	Muddy River, Brookline, 1893	Brookline	183	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	200
Fagus grandifolia American Beech	Muddy River, Brookline & Boston, 1892 & 1893		19	Zaitzevsky p.216		36/50
Fraxinus americana White Ash	Back Bay Fens, circa 1885	Northern Basin	22	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Fraxinus americana White Ash	Muddy River, Brookline & Boston, 1892 & 1893		29	Zaitzevsky p.216		15/20
Genista tinctoria Dyer's Greenwood	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on exposed dry slopes	B	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Genista tinctoria Dyer's Greenwood	Muddy River, Brookline & Boston, 1892 & 1893		135	Zaitzevsky p.218		650/900
Geranium maculatum Wild Geranium	Muddy River, Brookline, 1893	Brookline	178	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	700
Gleditsia triacanthos Common Honey Locust	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	33	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	1 deleted
Gleditsia triacanthos *Common Honey Locust*	Back Bay Fens, circa 1885	Northern Basin	5	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	

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Muddy River

Scientific Name **Common Name**	**Historic Use**	**Location**	**Symbol on Plan**	**Historic Source**	**Notes**	**Quantity Brookline/Boston**
Gymnocladus dioicus Kentucky Coffeetree	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	34	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	1 deleted
Halesia carolina Carolina Silverbell	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	106	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	13? deleted
Hamamelis virginiana Common Witchhazel	Muddy River, Brookline & Boston, 1892 & 1893		107	Zaitzevsky p.217		325/400
Hypericum kalmianum Kalm Saint Johnswort	Muddy River, Brookline & Boston, 1892 & 1893		136	Zaitzevsky p.218		450/600
Ilex verticillata Winterberry	Muddy River, Brookline & Boston, 1892 & 1893		117	Zaitzevsky p.218		260/340
Iris kaempferi Japanese Iris	Muddy River, Brookline, 1893	Brookline	160	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	400
Iris sibirica Siberian Iris	Muddy River, Brookline, 1893	Brookline	161	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	400
Juniperus prostrata Prostrate Juniper	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on high ground, on the knolls, and along the base of the wall	C	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Juniperus virginiana Red Cedar	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on high ground, on the knolls, and along the base of the wall	C	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	

Juniperus virginiana Eastern Red Cedar	Muddy River, Brookline & Boston, 1892 & 1893		18	Zaitzevsky p.216		[illegible]
Kerria japonica Kerria	Muddy River, Brookline & Boston, 1892 & 1893		75~	Zaitzevsky p.217		800/1100
Koelreuteria paniculata Goldenrain Tree	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	20	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	?
Lavendula Sea Lavender	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on the margin of the water and along the shores above common flood but subject to spray	A	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	?
Leucothoe racemosa Sweetbells	Muddy River, Brookline & Boston, 1892 & 1893		137	Zaitzevsky p.218		100/133
Ligustrum Privet	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on high ground, on the knolls, and along the base of the wall	C	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Ligustrum ibota Ibota Privet	Muddy River, Brookline & Boston, 1892 & 1893		118~	Zaitzevsky p.218		150/200
Ligustrum ovalifolium California Privet	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	95	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	811? deleted

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Scientific Name **Common Name**	**Historic Use**	**Location**	**Symbol on Plan**	**Historic Source**	**Notes**	**Quantity Brookline/Boston**
Ligustrum vulgare Common Privet	Muddy River, Brookline & Boston, 1892 & 1893		94	Zaitzevsky p.217		1900/5000
Lindera benzoin Spicebush	Muddy River, Brookline & Boston, 1892 & 1893		72	Zaitzevsky p.217		800/1000
Liquidambar styraciflua Sweetgum	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	32	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	5 deleted
Liriodendron tulipifera Tulip Tree	Muddy River, Brookline & Boston, 1892 & 1893		30	Zaitzevsky p.216		10/13
Lonicera fragrantissima Winter Honeysuckle	Muddy River, Brookline & Boston, 1892 & 1893		119	Zaitzevsky p.218		385/425
Lonicera japonica Japanese Honeysuckle	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on exposed dry slopes	B	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Lonicera japonica repens Hardyleaf Japanese Honeysuckle	Muddy River, Brookline & Boston, 1892 & 1893		104	Zaitzevsky p.217		1000/1400
Lonicera japonica repens Hardyleaf Japanese Honeysuckle	Muddy River, Brookline & Boston, 1892 & 1893		71	Zaitzevsky p.217		710/1000

Lonicera morrowi Morrow Honeysuckle	Muddy River, Brookline & Boston, 1892 & 1893		120?~	Zaitzevsky p.218		370/490
Lonicera tatarica Tatarian Honeysuckle	Muddy River, Brookline & Boston, 1892 & 1893		121?~	Zaitzevsky p.218		60/80
Lonicera xylosteum European Fly Honeysuckle	Muddy River, Brookline & Boston, 1892 & 1893		122?~	Zaitzevsky p.218		70/85
Lycium barbarum Barbary Matrimony Vine	Muddy River, Brookline & Boston, 1892 & 1893		105	Zaitzevsky p.217		650/900
Lysimachia nummularia Moneywort	Muddy River, Brookline, 1893	Brookline	157	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	500
Lythrum salicaria roseum Rose Loosestrife	Muddy River, Brookline, 1893	Brookline	162	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	300
Magnolia acuminata Cucumber Tree	Muddy River, Brookline & Boston, 1892 & 1893		31~	Zaitzevsky p.216		10/13
Mahonia aquifolium Oregon Holly	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on exposed dry slopes	B	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Malus baccata Siberian Crabapple	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	110	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	2 deleted

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Muddy River

Scientific Name Common Name	Historic Use	Location	Symbol on Plan	Historic Source	Notes	Quantity Brookline/Boston
Menispermum canadense Common Moonseed	Muddy River, Brookline & Boston, 1892 & 1893		100	Zaitzevsky p.217		250/350
Morus alba White Mulberry	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	15	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	1 deleted
Myosotis scorpioides True Forget-Me-Not	Muddy River, Brookline, 1893	Brookline	184	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	300
Myrica cerifera Wax Myrtle	Muddy River, Brookline & Boston, 1892 & 1893		82*	Zaitzevsky p.217		1820/2400
Myrica gale Sweetgale	Muddy River, Brookline & Boston, 1892 & 1893		138	Zaitzevsky p.218		150/200
Nyssa sylvatica Black Tupelo	Muddy River, Brookline & Boston, 1892 & 1893		21	Zaitzevsky p.216		10/13
Onoclea sensibilis Sensitive Fern	Muddy River, Brookline, 1893	Brookline	166	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	200
Osmunda cinnamomea Cinnamon Fern	Muddy River, Brookline, 1893	Brookline	168	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	350
Osmunda claytoniana Interrupted Fern	Muddy River, Brookline, 1893	Brookline	165	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	200
Ostrya virginiana Eastern Hophornbeam	Muddy River, Brookline & Boston, 1892 & 1893		45	Zaitzevsky p.216		10/13

Parthenocissus quinquefolia Virginia Creeper	Muddy River, Brookline & Boston, 1892 & 1893		78*	Zaitzevsky p.217		512/700
Parthenocissus quinquefolia hirsuta Variety of Virginia Creeper	Muddy River, Brookline & Boston, 1892 & 1893		101	Zaitzevsky p.217		?/?
Physocarpus opulifolius Eastern Ninebark	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	126	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	?
Physocarpus opulifolius Eastern Ninebark	Muddy River, Brookline & Boston, 1892 & 1893		98	Zaitzevsky p.217		250/330
Picea glauca White Spruce	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on high ground, on the knolls, and along the base of the wall	C	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Pinus cembra Swiss Stone Pine	Back Bay Fens, circa 1885	Northern Basin	3	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Pinus resinosa Red Pine	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on high ground, on the knolls, and along the base of the wall	C	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Pinus resinosa Red Pine	Back Bay Fens, circa 1885	Northern Basin	2	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	

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Scientific Name Common Name	Historic Use	Location	Symbol on Plan	Historic Source	Notes	Quantity Brookline/Boston
Pinus strobus White Pine	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on high ground, on the knolls, and along the base of the wall	C	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Pinus strobus Eastern White Pine	Back Bay Fens, circa 1885	Northern Basin	1	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Platanus orientalis Oriental Plane Tree	Muddy River, Brookline & Boston, 1892 & 1893		35	Zaitzevsky p.216		10/13
Populus deltoides Eastern Cottonwood	Muddy River, Brookline & Boston, 1892 & 1893		36	Zaitzevsky p.216		5/7
Populus nigra 'Italica' Lombardy Poplar	Muddy River, Brookline & Boston, 1892 & 1893		37~	Zaitzevsky p.216		15/20
Potentilla fructicosa Bush Cinquefoil	Muddy River, Brookline & Boston, 1892 & 1893		85	Zaitzevsky p.217		2000/2700
Prunus cerasifera Myrobalan Plum	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	108	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	1 deleted
Prunus maritima Beach Plum	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on the margin of the water and along the shores above common flood but subject to spray	A	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Prunus maritima	Muddy River,	St. Mary's St. to				

Ptelea trifoliata Hoptree	Muddy River, Brookline & Boston, 1892 & 1893		68	Zaitzevsky p.217		150/200
Pteretis nodulosa Ostrich Fern	Muddy River, Brookline, 1893	Brookline	169	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	300
Quercus alba White Oak	Back Bay Fens, circa 1885	Northern Basin	9	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Quercus alba White Oak	Muddy River, Brookline & Boston, 1892 & 1893		2*	Zaitzevsky p.216		205/360
Quercus bicolor Swamp White Oak	Muddy River, Brookline & Boston, 1892 & 1893		6	Zaitzevsky p.216		5/7
Quercus coccinea Scarlet Oak	Back Bay Fens, circa 1885	Northern Basin	6	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Quercus coccinea Scarlet Oak	Muddy River, Brookline & Boston, 1892 & 1893		3	Zaitzevsky p.216		19/25
Quercus macrocarpa Bur Oak	Back Bay Fens, circa 1885	Northern Basin	15	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Quercus macrocarpa Bur Oak	Muddy River, Brookline & Boston, 1892 & 1893		5	Zaitzevsky p.216		5/7
Quercus palustris Pin Oak	Muddy River, Brookline & Boston, 1892 & 1893		4	Zaitzevsky p.216		12/16

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Muddy River

Scientific Name Common Name	Historic Use	Location	Symbol on Plan	Historic Source	Notes	Quantity Brookline/Boston
Quercus phellos Willow Oak	Back Bay Fens, circa 1885	Northern Basin	21	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Quercus prinus Chestnut Oak	Back Bay Fens, circa 1885	Northern Basin	10	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Quercus prinus Chestnut Oak	Muddy River, Brookline & Boston, 1892 & 1893		7	Zaitzevsky p.216		12/16
Quercus rubra Red Oak	Muddy River, Brookline & Boston, 1892 & 1893		1*	Zaitzevsky p.216		305/400
Quercus rubra Northern Red Oak	Back Bay Fens, circa 1885	Northern Basin	8	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Quercus velutina Black Oak	Back Bay Fens, circa 1885	Northern Basin	16	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Raspberry	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on exposed dry slopes	B	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Rhamnus Sea Buckthorn	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on the margin of the water and along the shores above common flood but subject to spray	A	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Rhamnus catharticus Common Buckthorn	Muddy River, Brookline & Boston, 1892 & 1893		152*	Zaitzevsky p.218		115/1500
Rhododendron	Muddy River,					

Rhododendron nudiflorum Pinxterbloom	Muddy River, Brookline, 1893	Brookline	155	Zaitzevsky p.220	firm.	
Rhododendron viscosum Swamp Azalea	Muddy River, Brookline, 1893	Brookline	154	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	150
Rhus aromatica Fragrant Sumac	Muddy River, Brookline & Boston, 1892 & 1893		77	Zaitzevsky p.217		2150/2800
Rhus copallina Shining Sumac	Muddy River, Brookline & Boston, 1892 & 1893		129	Zaitzevsky p.218		175/225
Rhus glabra Smooth Sumac	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	111	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	?
Rhus typhina Staghorn Sumac	Muddy River, Brookline & Boston, 1892 & 1893		112	Zaitzevsky p.217		800/1000
Robinia psuedoacacia Black Locust	Back Bay Fens, circa 1885	Northern Basin	23	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Rosa carolina Carolina Rose	Muddy River, Brookline & Boston, 1892 & 1893		139*	Zaitzevsky p.218		500/700
Rosa eglanteria Sweetbrier	Muddy River, Brookline & Boston, 1892 & 1893		140*	Zaitzevsky p.218		550/700

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Muddy River

Scientific Name **Common Name**	Historic Use	Location	Symbol on Plan	Historic Source	Notes	Quantity Brookline/Boston
Rosa multiflora Japanese Rose	Muddy River, Brookline & Boston, 1892 & 1893		73~	Zaitzevsky p.217		230/300
Rosa virginiana Virginia Rose	Muddy River, Brookline & Boston, 1892 & 1893		76*	Zaitzevsky p.217		8000/10700
Rosa wichuraiana Memorial Rose	Muddy River, Brookline & Boston, 1892 & 1893		86~	Zaitzevsky p.217		500/700
Rubus hispidus Swamp Dewberry	Muddy River, Brookline & Boston, 1892 & 1893		151	Zaitzevsky p.218		300/4400
Rubus odoratus Flowering Raspberry	Muddy River, Brookline & Boston, 1892 & 1893		141	Zaitzevsky p.218		900/1200
Salidago Goldenrod	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on the margin of the water and along the shores above common flood but subject to spray	A	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Salix alba White willow	Back Bay Fens, circa 1885	Northern Basin	7	Zaitzevsky p.190	Tree planting plan by W.L. Fischer.	
Salix alba 'Chermesina' Redstem Willow	Muddy River, Brookline & Boston, 1892 & 1893		40	Zaitzevsky p.216		12/?

Salix alba f.argentea 'Sericea' Silverstem Willow	Muddy River, Brookline & Boston, 1892 & 1893		39	Zaitzevsky p.216		13/13
Salix alba 'Vitellina' Yellowstem Willow	Muddy River, Brookline & Boston, 1892 & 1893		38	Zaitzevsky p.216		10/13
Salix babylonica Babylon Weeping Willow	Muddy River, Brookline & Boston, 1892 & 1893		41	Zaitzevsky p.216		12/16
Salix pentandra Laurel Willow	Muddy River, Brookline & Boston, 1892 & 1893		113	Zaitzevsky p.217		15/20
Salix tristis Dwarf Gray Willow	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on exposed dry slopes	B	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Salix tristis Dwarf Gray Willow	Muddy River, Brookline & Boston, 1892 & 1893		142	Zaitzevsky p.218		2000/2700
Salt Sedge	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used along water	-	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	

Frederick Law Olmsted Plant List
Muddy River

Scientific Name Common Name	Historic Use	Location	Symbol on Plan	Historic Source	Notes	Quantity Brookline/Boston
Sambucas canadensis American Elder	Muddy River, Brookline & Boston, 1892 & 1893		130*	Zaitzevsky p.218		200/260
Saponaria officinalis Bouncing Bet	Muddy River, Brookline, 1893	Brookline	159	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	200
Sassafras albidum Common Sassafras	Muddy River, Brookline & Boston, 1892 & 1893		17	Zaitzevsky p.216		5/7
Shepherdia canadensis Russet Buffaloberry	Muddy River, Brookline & Boston, 1892 & 1893		150	Zaitzevsky p.218		10/015
Sorbus aucuparia European Mountain Ash	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	47,109	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	3 deleted
Sorbus decora Showy Mountain Ash	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	48	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	2 deleted
Spirea salicifolia Willowleaf Spirea	Muddy River, Brookline & Boston, 1892 & 1893		143	Zaitzevsky p.218		50/70
Spirea tomentosa Hardhack	Muddy River, Brookline & Boston, 1892 & 1893		144	Zaitzevsky p.218		150/200
Spirea x vanhouttei Vanhoutte Spirea	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	131	Zaitzevsky p.219	Additional plants ordered by Olmsted firm.	80?
Staphylea trifolia American Bladdernut	Muddy River, Brookline & Boston,		132	Zaitzevsky p.218		

Swamp Dewberry	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on exposed dry slopes	B	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Symphoricarpos albus ?	Muddy River, Brookline & Boston, 1892 & 1893		146	Zaitzevsky p.218		600/800
Symphoricarpos albus laevigatus Snowberry	Muddy River, Brookline & Boston, 1892 & 1893		145	Zaitzevsky p.218		575/700
Symphoricarpos orbiculatus Indian Currant	Muddy River, Brookline & Boston, 1892 & 1893		147	Zaitzevsky p.218		1850/2400
Tamarix ramosissima Tamarix	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on the margin of the water and along the shores above common flood but subject to spray	A	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Tilia ? Linden ?	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	43	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	?
Tilia americana American Basswood	Muddy River, Brookline & Boston, 1892 & 1893		42	Zaitzevsky p.216		5/7
Trillium grandiflorum Large White Trillium	Muddy River, Brookline, 1893	Brookline	173	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	350

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Muddy River

Scientific Name **Common Name**	Historic Use	Location	Symbol on Plan	Historic Source	Notes	Quantity Brookline/Boston
Ulmus americana American Elm	Muddy River, Brookline & Boston, 1892 & 1893		12*	Zaitzevsky p.216		136/175
Ulmus rubra Slippery Elm	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	13	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	14 deleted
Ulmus thomasii Rock Elm	Muddy River, Brookline & Boston, 1892 & 1893		14	Zaitzevsky p.216		5/7
Vaccinium minus Mountain Cranberry	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on exposed dry slopes	B	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Viburnum Viburnum	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on high ground, on the knolls, and along the base of the wall	C	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Viburnum acerifolium Mapleleaf Viburnum	Muddy River, Brookline & Boston, 1892 & 1893		87	Zaitzevsky p.217		230/300
Viburnum cassinoides Witherod	Muddy River, Brookline & Boston, 1892 & 1893		88	Zaitzevsky p.217		13-Oct
Viburnum dentatum Arrowwood	Muddy River, Brookline & Boston, 1892 & 1893		89	Zaitzevsky p.217		

Viburnum lentago Nannyberry	Muddy River, Brookline & Boston, 1892 & 1893		90	Zaitzevsky p.217		[illegible]
Viburnum nudum Smooth Witherod	Muddy River, Brookline & Boston, 1892 & 1893		91	Zaitzevsky p.217		50/65
Viburnum opulus European Cranberrybush	Muddy River, Brookline & Boston, 1892 & 1893		92	Zaitzevsky p.217		105/140
Viburnum prunifolium Black Haw Common Privet	Muddy River, Brookline & Boston, 1892 & 1893		93	Zaitzevsky p.217		315/400
Vinca minor Periwinkle	Muddy River, Brookline, 1893	Brookline	153	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	500
Vinca minor Periwinkle	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on exposed dry slopes	B	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Virginia rose Virginia rose	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on the margin of the water and along the shores above common flood but subject to spray	A	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	

Frederick Law Olmsted Plant List
Muddy River

Scientific Name Common Name	Historic Use	Location	Symbol on Plan	Historic Source	Notes	Quantity Brookline/Boston
Vitis indivisa Grape	Suggested Key for Beacon Entrance Back Bay Fens, 1884	Used on exposed dry slopes	B	Zaitzevsky p.188	No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook.	
Woodwardia virginica Virginia Chainfern	Muddy River, Brookline, 1893	Brookline	171	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	500
Xanthorhiza simplicissima Yellowroot	Muddy River, Brookline & Boston, 1892 & 1893		148	Zaitzevsky p.218		7750/10400
Yucca filamentosa Common Yucca	Muddy River, Brookline, 1893	Brookline	179	Zaitzevsky p.220	Additional plants ordered by Olmsted firm.	100
Zanthoxylum americanum Common Prickly-ash	Muddy River, Brookline 1892	St. Mary's St. to Cumberland Ave.	114	Zaitzevsky p.219	Plants deleted by Sargent from plant list.	?

Appendix

Plant List I. Suggested key for Figure 100, Beacon Entrance planting plan, [illegible]

Letter on plan	Location	Plants
A	On the margin of the water and along the shores above common flood but subject to spray	Sea lavender, golden rod, asters, beach peas, beach plum, sea buckthorn, tamarix, virginia rose
B	Exposed dry slopes	Bayberry, sweet fern, dyer's greenwood, Oregon holly grape, bearberry, mountain cranberry, raspberry, blackberry, swamp dewberry, dwarf gray willow; vines and ground-cover plants, such as periwinkle, clematis, and Japanese honeysuckle, planted among them
C	On high ground, on the knolls, and along the base of the wall	White and red pines, white spruce, red cedar, white and dwarf birch; prostrate juniper; nursery shrubs, such as barberry, privet, summersweet, viburnum
—	Unmarked strip along water	Salt sedge

a. No formal plant lists exist for Beacon Entrance. The plants listed here are taken from Olmsted's letters to F. L. Temple, from Temple's contract, and from Charles Eliot's Weekly Notebook. See also the grading plan for Beacon Entrance, Figure 120.

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Plant List 2. Key for Figure 162, tree planting plan by W. L. Fischer for the northern basin, Back Bay Fens, circa 1885.[a]

Number on plan	Scientific name[b]	Common name
1	*Pinus strobus*	Eastern white pine
2	*Pinus resinosa*	Red pine
3	*Pinus cembra*	Swiss stone pine
4	*Ailanthus altissima (glandulosa)*, female	Tree of heaven
5	*Gleditsia triacanthos*	Common honey locust
6	*Quercus coccinea*	Scarlet oak
7	*Salix alba*	White willow
8	*Quercus rubra*	Northern red oak
9	*Quercus alba*	White oak
10	*Quercus prinus*	Chestnut oak
11	*Acer rubrum*	Red maple
12	*Acer saccharinum (dasycarpum)*	Silver maple
13	*Acer platanoides*	Norway maple
14	*Acer saccharum (saccharinum)*	Sugar maple
15	*Quercus macrocarpa*	Bur oak
16	*Quercus velutina (tinctoria)*	Black oak
17	*Betula pendula (alba)*	European birch
18	*Betula lenta*	Sweet birch
19	*Betula papyrifera (papyracea)*	Paper birch
20	*Betula nigra*	River birch
21	*Quercus phellos*	Willow oak
22	*Fraxinus americana*	White ash
23	*Robinia pseudoacacia*	Black locust
24	*Cladrastis lutea (Virgilia lutea)*	American yellow wood

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a. No quantities are given with this key. On the plan, oaks and pines are used predominantly.

b. Obsolete names used by Fischer are given in parentheses. Modern botanical names are from Alfred Rehder, *Bibliography of Cultivated Trees and Shrubs* (Jamaica Plain, Mass.: Arnold Arboretum of Harvard University, 1949).

1*	*Quercus rubra*			
2*	*Quercus alba*	White oak	205	360
3	*Quercus coccinea*	Scarlet oak	19	25
4	*Quercus palustris*	Pin oak	12	16
5	*Quercus macrocarpa*	Bur oak	5	7
6	*Quercus bicolor*	Swamp white oak	5	7
7	*Quercus prinus*	Chestnut oak	12	16
8*	*Acer saccharum (saccharinum)*	Sugar maple	200	260
9	*Acer saccharinum (dasycarpum)*	Silver maple	30	40
10	*Acer rubrum*	Red maple	30	40
11	*Acer negundo*	Box elder	10	13
12*	*Ulmus americana*	American elm	136	175
14	*Ulmus thomasii (racemosa)*	Rock elm	5	7
17	*Sassafras albidum (officinalis)*	Common sassafras	5	7
18	*Juniperus virginiana*	Eastern red cedar	10	13
19	*Fagus grandifolia (ferruginea)*	American beech	36	50
21	*Nyssa sylvatica (multiflora)*	Black tupelo	10	13
23	*Betula nigra*	River birch	18	24
24	*Betula lenta*	Sweet birch	5	7
25	*Betula lutea*	Yellow birch	10	13
27	*Betula papyrifera*	Paper birch	5	7
28	*Celtis occidentalis*	Hackberry	5	7
29	*Fraxinus americana*	White ash	15	20
30	*Liriodendron tulipifera*	Tulip tree	10	13
31†	*Magnolia acuminata*	Cucumber tree	10	13
35	*Platanus orientalis*	Oriental plane tree	10	13
36	*Populus deltoides (monolifera)*	Eastern cottonwood	5	7
37†	*Populus nigra italica (P. nigra pyramidalis)*	Lombardy poplar	15	20
38	*Salix alba vitellina*	Yellowstem willow	10	13
39	*Salix alba sericea (S. alba argentea)*	?	13	13
40	*Salix alba f. chermesina (S. alba britzensis)*	Redstem willow	12	?
41	*Salix babylonica*	Babylon weeping willow	12	16
42	*Tilia americana*	American basswood	5	7
45	*Ostrya virginiana (virginica)*	Eastern hophornbeam	10	13
46	*Carpinus caroliniana (americana)*	American hornbeam	5	7
60*	*Cornus florida*	Flowering dogwood	300	400
61*	*Cornus alternifolia*	Alternate-leaved dogwood	1,040	1,350
62*	*Cornus racemosa (paniculata)*	Gray dogwood	1,320	1,700
63	*Cornus sanguinea*	Bloodtwig dogwood	603	800
64	*Cornus amomum (sericea)*	Silky dogwood	180	240
65	*Cornus sericea (stolonifera)*	Red osier dogwood	600	800

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A. Brookline and Boston, 1892 and 1893 (*continued*).

Number on plan	Scientific name	Common name	Total no., Brookline	Total no., Boston
115	*Baccharis halimifolia*	Groundsel bush	?	?
116†	*Colutea arborescens*	Bladder senna	150	200
117	*Ilex verticillata*	Winterberry	260	340
118†	*Ligustrum ibota*	Ibota privet	150	200
119	*Lonicera fragrantissima*	Winter honeysuckle	385	425
120?†	*Lonicera morrowi*	Morrow honeysuckle	370	490
121?†	*Lonicera tatarica*	Tatarian honeysuckle	60	80
122?†	*Lonicera xylosteum*	European fly honeysuckle	70	85
123	*Alnus firma*	?	?	?
124	*Amelanchier canadensis*	Shadblow serviceberry	150	200
125	*Chionanthus virginicus*	Fringetree	?	?
128	*Aronia arbutifolia* (*Pyrus arbutifolia*)	Red chokeberry	25	30
129	*Rhus copallina*	Shining sumac	175	225
130*	*Sambucus canadensis*	American elder	200	260
132	*Staphylea trifolia*	American bladdernut	?	?
133*	*Comptonia peregrina asplenifolia* (*Comptonia asplenifolia*)	Sweet fern	1,000	1,400
134	*Diervilla lonicera* (*trifida*)	Dwarf bush-honeysuckle	50	70
135	*Genista tinctoria*	Dyer's greenwood	650	900
136	*Hypericum kalmianum*	Kalm Saint Johnswort	450	600
137	*Leucothoë racemosa*	Sweet bells	100	133
138	*Myrica gale*	Sweet gale	150	200
139*	*Rosa carolina*	Carolina rose	500	700
140*	*Rosa eglanteria* (*rubiginosa*)	Sweetbrier	550	700
141	*Rubus odoratus*	Flowering raspberry	900	1,200
142	*Salix tristis*	Dwarf gray willow	2,000	2,700
143	*Spiraea salicifolia*	Willowleaf spirea	50	70
144	*Spiraea tomentosa*	Hardhack	150	200
145	*Symphoricarpos albus laevigatus* (*racemosus*)	Snowberry	575	700
146	*Symphoricarpos albus* (*pauciflorus*)	?	600	800
147	*Symphoricarpos orbiculatus* (*vulgaris*)	Indian currant or coralberry	1,850	2,400
148	*Xanthorhiza simplicissima* (*apiifolia*)	Yellowroot	7,750	10,400
150	*Shepherdia canadensis*	Russet buffaloberry	10	15
151	*Rubus hispidus*	Swamp dewberry	3,000	4,400
152*	*Rhamnus catharticus*	Common buckthorn	1,150	1,500

67	*Crataegus pedicellata (coccinea)*	Scarlet hawthorn		
68	*Ptelea trifoliata*	Hoptree	150	200
70	*Acer spicatum*	Mountain maple	75	100
71	*Lonicera japonica repens (L. flexuosa)*	Hardyleaf Japanese honeysuckle	710	1,000
72	*Lindera benzoin*	Spicebush	800	1,000
73†	*Rosa multiflora*	Japanese rose	230	300
74?†	*Calycanthus floridus*	Carolina allspice	350	500
75†	*Kerria japonica*	Kerria	800	1,100
76*	*Rosa virginiana (lucida)*	Virginia rose	8,000	10,700
77	*Rhus aromatica (canadensis)*	Fragrant sumac	2,150	2,800
78*	*Parthenocissus quinquefolia (Ampelopsis quinquefolia)*	Virginia creeper	512	700
79*	*Celastrus scandens*	American bittersweet	409	550
80	*Clethra alnifolia*	Summersweet	2,400	3,200
82*	*Myrica cerifera*	Wax myrtle	1,820	2,400
83	*Cephalanthus occidentalis*	Buttonbush	330	400
84	*Ceanothus americanus*	New Jersey tea	1,115	1,500
85	*Potentilla fruticosa*	Bush cinquefoil	2,000	2,700
86†	*Rosa wichuraiana*	Memorial rose	500	700
87	*Viburnum acerifolium*	Mapleleaf viburnum	230	300
88	*Viburnum cassinoides*	Witherod	10	13
89	*Viburnum dentatum*	Arrowwood	300?	400?
90	*Viburnum lentago*	Nannyberry	75	100
91	*Viburnum nudum*	Smooth witherod	50	65
92	*Viburnum opulus*	European cranberrybush	105	140
93	*Viburnum prunifolium*	Black haw	315	400
94	*Ligustrum vulgare*	Common privet	1,900	5,000
96*	*Berberis vulgaris*	Common barberry	1,300	1,700
97*	*Berberis thunbergii*	Japanese barberry	1,800	2,400
98	*Physocarpus opulifolius (Spiraea opulifolia)*	Eastern ninebark	250	330
99	*Akebia quinata*	Fiveleaf akebia	300	400
100	*Menispermum canadense*	Common moonseed	250	350
101	*Parthenocissus quinquefolia hirsuta (Amelopsis quinquefolia radicans* or *radicantissima)*	Variety of Virginia creeper	?	?
104	*Lonicera japonica repens (Lonicera flexuosa)*	Hardyleaf Japanese honeysuckle	1,000	1,400
105	*Lycium barbarum*	Barbary matrimony vine	650	900
107	*Hamamelis virginiana*	Common witch hazel	325	400
112	*Rhus typhina*	Staghorn sumac	800	1,000
113	*Salix pentandra*	Laurel willow	15	20

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B. Plants deleted by Sargent from April 1892 plant list for Brookline side:
St. Mary's Street to Cumberland Avenue.

No. on plan	Scientific name	Common name	Total no. deleted
13	*Ulmus fulva*	Slippery elm	14
15	*Morus alba*	White mulberry	1
16	*Abies alba*	Silver fir	3
20	*Koelreuteria paniculata*	Goldenrain tree	?
22	*Betula pendula (alba)*	European birch	?
26	*Betula populifolia*	Gray birch	3
32	*Liquidambar styraciflua*	Sweet gum	5
33	*Gleditsia triacanthos*	Common honey locust	1
34	*Gymnocladus dioicus*	Kentucky coffeetree	1
43	*Tilia?*	Linden?	?
44	*Cercis canadensis*	Eastern redbud	?
47, 109	*Sorbus aucuparia (Pyrus aucuparia)*	European mountain ash or rowan tree	3
48	*Sorbus decora (Pyrus americana)*	Showy mountain ash	2
69	*Alnus incana*	Speckled alder	?
81	*Acanthopanax sieboldianus (Aralia pentophylla)*	Five-leaf acanthopanax	49
95	*Ligustrum ovalifolium*	California privet	811?
102	*Clematis virginiana*	Virgin's bower	?
103	*Clematis vitalba*	Traveler's joy	?
106	*Halesia carolina (tetraptera)*	Carolina silverbell	13?
108	*Prunus cerasifera (mirobolona)*	Myrobalan plum	1
110	*Malus baccata (Pyrus baccata)*	Siberian crab apple	2
111	*Rhus glabra*	Smooth sumac	?
114	*Zanthoxylum americanum*	Common prickly ash	?
126	*Physocarpus opulifolius (Spiraea opulifolia)* (kept in as 98)	Eastern ninebark	?
127	*Prunus maritima*	Beach plum	?
131	*Spiraea x vanhouttei*	Vanhoutte spirea	80?
149	*Elaeagnus multiflorus (longipes)*	Cherry elaeagnus	5

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No. on plan	Scientific name	Common name	Total no.
153	*Vinca minor*	Periwinkle	500
154	*Rhododendron viscosum (Azalea viscosa)*	Swamp azalea	150
155	*Rhododendron nudiflorum (Azalea nudiflora)*	Pinxterbloom	150
156	*Rhododendron canadense (Rhodora canadensis)*	Rhodora	300
157	*Lysimachia nummularia*	Moneywort	500
158	*Caltha palustris*	Marsh marigold	500
159	*Saponaria officinalis*	Bouncing bet	200
160	*Iris kaempferi*	Japanese iris	400
161	*Iris sibirica*	Siberian iris	400
162	*Lythrum salicaria roseum (L. roseum superbum)*	Rose loosestrife	300
163	*Adiantum pedatum*	American maidenhair fern	400
164	*Dennstedtia punctilobula (Dicksonia punctiloba)*	Hay-scented fern	400
165	*Osmunda claytoniana*	Interrupted fern	200
166	*Onoclea sensibilis*	Sensitive fern	200
167	*Athyrium felixfemina (Asplenium felix foeminia)*	Lady fern	300
168	*Osmunda cinnamomea*	Cinnamon fern	350
169	*Pteretis nodulosa (Onoclea struthiopteris)*	Ostrich fern	300
170	*Ajuga genevensis*	Geneva bugle	500
171	*Woodwardia virginica*	Virginia chainfern	500
172	*Aster novae-angliae*	New England aster	300
173	*Trillium grandiflorum*	Large white trillium	350
174	*Aster undulatus*	Wave aster	550
175	*Cardamine pratensis*	Cuckooflower or lady's smock	300
176	*Acorus calamus*	Sweet flag	200
177	*Anemone canadensis (pennsylvanica)*	Meadow anemone	700
178	*Geranium maculatum*	Wild geranium	700
179	*Yucca filamentosa*	Common yucca or Adam's needle	100
180	*Boltonia latisquama*	Violet boltonia	150
181	*Cassia marilandica*	Wild senna	30
182	*Coreopsis lanceolata*	Lance coreopsis	300
183	*Erigeron speciosus*	Oregon fleabane	200
184	*Myosotis scorpioides (palustris)*	True forget-me-not	300

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